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To the Graduate Council:

I am submitting herewith a thesis written by Bryan Clayborne entitled "Occupy the Food Supply: The University of Tennessee and Food Insecurity." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a major in Sociology.

Robert E. Jones, Major Professor

We have read this thesis and recommend its acceptance:

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Occupy the Food Supply: The University of Tennessee and Food Insecurity

A Thesis Presented for the
Master of Arts
Degree
The University of Tennessee, Knoxville

Bryan Clayborne

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#BlackLivesMatter #ProtectBlackWomen

ABSTRACT

Food insecurity is defined as the inability to access adequate, safe, and nutritious food. A lack of financial resources and food-management skills leads many college students to experience food insecurity. This study explores the barriers and bridges of food insecurity among undergraduate students taking social science courses at the University of Tennessee-Knoxville. An online survey was sent to students during the spring and summer semester of 2020. Predictors of food insecurity and the coping strategies students may use when running low on food were placed into an exploratory model. The exploratory model and its assumptions were then tested using six hypotheses. Survey responses were analyzed using descriptive statistics, Pearson (bivariate) correlations, and multiple linear regression. The findings show that Black and Hispanic students were more food insecure than White students. Food insecurity was also related to previous household food insecurity, less financial security, food assistance use, fewer monthly expenditures, lack of attachment to campus, negative experiences receiving food on campus, more perceived barriers to healthy eating, and the use of food coping strategies.

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INTRODUCTION

Food insecurity is defined as “the limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable food in socially acceptable ways.” (USDA 2019). On a global scale, financial resources play an important role in determining who has access to adequate and nutritious foods. More economically developed countries that are wealthy and industrialized have access to more resources allowing for a better quality of life. While economically developing countries face many hardships and are less likely to have access to vital resources such as food. For example, in 2018, Sub-Saharan Africa had the highest prevalence of food insecurity (57.7%), followed by South Asia (34.3%) and Latin America (30.9%) (FAO 2019). Nationally, 11.1% of U.S. households reported being food insecure in 2018, equating to 14.3 million households living in food-insecure conditions (Coleman-Jensen et al., 2019). While food insecurity rates vary across the world, a lesser-studied population who may be food insecure is college students.

As college students transition from adolescence to young adulthood, they face new challenges and obstacles. For many, attending college marks the first time they have to solve problems without the help of their parent(s), legal guardian, or support system. One of these new challenges is the difficulty of creating and maintaining a healthy diet to sustain their lifestyle. Once they leave home, students can expect to deal with new financial obligations and develop food-management skills. Financial obligations include balancing new costs of living, buying textbooks, and paying for tuition. While food-management skills include having prior knowledge and resources for basic food preparation (Bruening et al., 2016; Gaines et al., 2014). A lack of financial resources and poor food-management skills can lead many students to become food-insecure.

This study explores the barriers and bridges students at the University of Tennessee-Knoxville have that exacerbates or alleviates food insecurity status. It seeks to compare the rate of food insecurity among students and identify predictor variables or factors that are associated with food insecurity status. An online survey was used to target Black and White students taking social sciences classes at the University of Tennessee-Knoxville. The collected data were used to test an exploratory model for better understanding and predicting food insecurity among underrepresented students. The findings show that Black and Hispanic students were more food insecure than White students. There was also a relationship between food insecurity, previous household food insecurity, less financial security, fewer monthly expenditures, more perceived barriers to healthy eating, and the use of coping strategies when running low on food.

This thesis is divided into six sections. This section will provide information on Environmental Justice and the Environmental Justice Movement along with Food Justice and the Food Justice Movement. The second section provides a review of food insecurity at multiple levels and identifies barriers and bridges to overcoming food insecurity. It also details the experiences of Black students who attend predominantly White institutions. Next, section three outlines the theoretical framework, exploratory model, and hypotheses used to guide the research project. Section four lays out the research design and methodology used to test the exploratory model and its assumptions. Section five presents the descriptive and inferential results used in the online survey. The last section, section six, provides a discussion and summary of the overall results, general conclusions, and study implications.

Background

Environmental Justice (EJ) and the Environmental Justice Movement (EJM)

Environmental Justice is defined as “the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies.” (EPA 2020). The Environmental Justice Movement is rooted in the principle that, “all people and communities are entitled to equal protection of environmental and public health laws and regulations.” (as cited in Brulle & Pellow 2006: 104). Terms such as *environmental injustice*, *environmental inequality*, and *environmental racism* commonly refer to laws, regulations, government programs, and policies that disproportionately expose vulnerable communities to pollution and its negative health effects through unequal environmental protection (Maantay 2002).

In 1982, a critical moment for the EJM took place in Warren County, North Carolina when a predominately Black and low-income neighborhood protested a landfill siting that would place 400,000 cubic yards of toxic polychlorinated biphenyls (PCBs) in their community. The protest caught national attention and law enforcement officers were brought in to restrain the protestors. Over 500 demonstrators were arrested marking the first time in U.S. history anyone had been arrested for attempting to stop the construction of a landfill. At this moment, Black people began to reframe environmental issues as issues of injustice, challenging the status quo of White middle-class forms of environmentalism (Agyeman et al., 2016; Bullard 2000; Mohai et al., 2009; Taylor 2011). Additionally, two important studies conducted by the U.S. General Accounting Office (1983) and the United Church of Christ (1987) helped legitimize the claims of EJ advocates. Both studies provided evidence through correlational analysis that communities of

color and low-income areas were being disproportionately exposed to environmental toxins through the placement of hazardous waste facilities.

In 1990, one of the first major studies linking historical patterns of racial segregation to hazardous facility siting in the south was conducted by Robert Bullard, the father of Environmental Justice (Bullard 2001; Mohai et al., 2009). EJ advocates and other grassroots organizations did not gain institutional legitimacy and power until 1994 when President Bill Clinton signed Executive Order 12898. This executive order acknowledged that Black people and other minority groups were being disproportionately exposed to environmental pollution and its associated health risks (Jones & Rainey 2006). Moreover, EJ advocates argue that the environment is not just a pristine place to visit, but is where we live, work, and play. The Food Justice Movement builds upon the foundations of the EJ Movement to include where we live, work, play, and how we eat.

Food Justice (FJ) and the Food Justice Movement (FJM)

Food Justice is defined as, “ensuring that the benefits and risks of where, what, and how food is grown and produced, transported, and distributed, and accessed and eaten are shared fairly.” (Gottlieb & Joshi 2010: 6). The Food Justice Movement is rooted in the principle of *Food Sovereignty* and *Just Sustainability*. Food sovereignty is: “the right to use and manage lands, water, seeds, livestock, and biodiversity to the rights to know about how food is produced by whom and where-to producers and consumers.” (Konefal & Hatanaka 2015: 202). While Just Sustainability refers to “a better quality of life for all, now, and into the future, in a just and equitable manner, while living within the limits of supporting ecosystems.” (Alkon & Agyeman 2011: 6). The FJM helps create Food Sovereignty and Just Sustainability by providing avenues

to rectify racial and economic injustice through economic empowerment and environmental protections for marginalized communities.

In 1995, the FJM gained legal traction when the Community Food Security Empowerment Act was introduced. This act “authorizes the Secretary of Agriculture to make temporary assistance available to support community food security projects designed to meet the food needs of low-income people.” (Community Food Security Act of 1995). The act was a response to the rapid industrialization that allowed food to be sold at cheaper prices. At this time, more affluent and White consumers began to notice the negative environmental and human health impacts of industrialized and processed food. This event prompted White consumers to create new niches in the food system for themselves; meanwhile, communities of color lacked access to organizational and financial resources to create niches for themselves (Morales 2011). To combat a lack of access to food for communities of color, alternative food systems and practices are used to create local food programs that meet their own culturally acceptable needs. These alternative food systems and practices include farmer markets, community-supported agriculture, farm to school programs, and community gardens (Alkon & Agyeman 2011; Gottlieb & Joshi 2010). The goal of these alternative practices is to develop institutions that, “support local, sustainable, and artisan food producers with good prices and steady markets and allows consumers access to wholesome, healthful, and “real” food.” (Guthman 2014: 1153). The FJM builds upon the EJM by providing a closer look at how communities of color lack environmental protections along with a lack of access to culturally acceptable foods.

LITERATURE REVIEW

The right to equal protection against environmental toxins and access to safe and nutritious food is a basic human right. But living in a society that has a historical legacy of racial exclusion and discrimination reveals that race and economics play an important role in determining who gets to enjoy environmental protection and who has access to healthy food options. Historically, and currently, communities of color are forced into subjugated positions that diminish their ability to fight environmental injustice and lack of access to culturally acceptable foods (Alkon & Agyeman 2011; Bullard 2001). When discussing food justice, one cannot ignore how race, racism, and economics play an important role in food politics. A combination of these factors creates barriers or obstacles that keep people from accessing food. Despite this, people have found bridges or other pathways to reduce their level of food insecurity. This literature review provides an overview of the bridges and barriers to food insecurity in the United States, urban Black communities, and U.S. colleges and universities. It also details the obstacles Black students have attending predominately White institutions.

Food Insecurity within the U.S.

The United States Department of Agriculture (USDA) defines food deserts as a “census tract with a substantial share of residents who live in low-income areas that have low levels of access to a grocery store or healthy, affordable food retail outlet.” (USDA 2011). To be considered a food desert census tract, a community must meet two qualifiers, which include being low-income and having low food access. First, a low-income community must have a “poverty rate of 20% or greater, or a median family income at or below 80% of the statewide or metropolitan area median family income.” (USDA 2011). While a low-access community must have “at least 500 persons and/or at least 33% of the population [living] more than 1 mile from a

supermarket or large grocery store (10 miles, in the case of rural census tracts).” (USDA 2011). There are an estimated 6,529 designated food deserts tracts in the U.S. and 63% of them are located in urban areas. More than 23.5 million Americans live in these food deserts and they tend to be mostly racial minorities, rely upon public assistance, have no access to a vehicle, and have lower levels of education, income, and employment (Dutko et al., 2012; Elsheikh & Barhoum 2013). A closer look at national household food insecurity shows similar characteristics.

In 2018, 11.1% (14.3 million) of U.S. households experienced food insecurity. Non-Hispanic Black (21.2%) and Hispanic (16.2%) households and households with incomes below 185% of \$25,465 experienced rates of food insecurity above the national average. In contrast, Non-Hispanic White (8.1%) households experienced rates of food insecurity below the national average. A lack of access to resources and the ability to have self-determination affects one’s ability to access food. For example, income was found to be strongly associated with those who experienced food insecurity in the U.S. (Coleman-Jensen et al., 2019).

Food insecurity is often a result of structural and racial inequalities that limit the socioeconomic ability of communities of color and is not a result of an actual food shortage. Food insecurity can limit the life expectancy of racial/ethnic groups. Black people are 1.8 times more likely to have diabetes than non-Hispanic Whites and are more likely to die from diabetes at higher rates than any other racial group (Elsheikh & Barhoum 2013). One of the major bridges for U.S. households that experienced food insecurity was enrolling in one of the three largest Federal Food and Nutrition Assistance Programs. These three programs include the Supplemental Nutrition Assistance Program (SNAP), free or reduced-price school lunch, and Women, Infants, and Children program (WIC) (Coleman-Jensen et al., 2019). Though food

insecurity occurs across the U.S., urban Black communities have historically faced unprecedented barriers to food access.

Food Insecurity in Urban Black Communities

Urban Black communities face racial segregation and redlining practices by land developers and large supermarkets that limit their access to healthy and affordable foods. Federal housing policies have historically excluded racial/ethnic minorities from participating in homeownership resulting in racially homogenous neighborhoods. While large grocery retailers avoid inner cities or low-profit areas and move existing stores to suburban areas. The combination of public policy and private sector decisions excludes Black communities from accessing healthy and affordable food options (Eisenhauer 2001; Raja et al., 2008; Jones et al., 2020). Along with this, issues such as the White flight from urban communities, and the “mass exodus” of grocery stores from inner cities to suburban and exurban locations resulted in inner cities being food insecure (Morales 2011; Jones et al., 2020).

A close look at an urban Black community in Southern Appalachia reveals their concerns with being food insecure. When asked if their households experienced any conditions of food insecurity outlined by the USDA, 53% of residents reported one or more conditions of being food insecure. Fifty-seven percent of residents worried their household would run out of food, 70% thought it was not easy to get fresh produce in their neighborhood, and 64% felt there was not a good grocery store nearby (Jones et al., 2020). When a household is experiencing levels of food insecurity fresh and unprocessed food items are the first excluded from their shopping lists. One of the biggest barriers that prevent Black people from eating healthy is the cost and access to food. Black communities located in food deserts tend to be overpopulated with smaller stores and fast-food restaurants with unhealthy food options (Kwate 2008; Jones et al., 2020). As a

result, these communities have an increased risk of higher obesity rates. The Center for Disease Control and Prevention found Black people (48.1%) have the highest rates of obesity followed by Latinos (42.5%) when adjusted for age (Ogden et al., 2015). Since residents cannot meet their dietary needs they often suffer from chronic and preventable diseases such as Coronary Heart Disease, Type II Diabetes, and Hypertension (Eisenhauer 2001; Ryabov 2016) Living in a food desert or food insecure area increases the likelihood that residents will experience higher levels of stress and physiological effects. Stress can stem from three sources such as negative life events, chronic strains, and daily hassles. When economically and socially vulnerable communities are exposed to multiple stressors it can lead to health complications, physical ailments, and anxiety which increases the chances of depression (Crowe et al., 2018; Williams et al., 1997). A study found that Black people are significantly more likely to report unfair treatment while shopping than their White and Latino counterparts. This unfair treatment includes being watched, followed, and treated with less respect. The worry of unfair treatment while shopping can lead to heightened stress and anxiety which further exacerbates health complications (Lee 2000; Zenk et al., 2014). A major bridge for urban Black communities who are food insecure includes finding transportation such as a bus, taxi, driving themselves, or shopping at small neighborhood stores. Other bridges include receiving food from food pantries/banks, churches, and other food distribution centers such as community programs or senior centers (Eisenhauer 2001; Jones et al., 2020). While urban Black communities face issues with food insecurity, college students who may leave these communities are also food insecure.

Food Insecurity within Colleges and Universities in the U.S.

When students experience food insecurity while trying to obtain their degree, it can negatively impact their ability to become successful. College food insecurity is associated with

poor academic outcomes, poorer self-reported physical health, higher perceived levels of stress, and symptoms of depression. As inflation and the cost of living is on the rise, students face many financial demands such as paying for tuition, textbooks, housing, and medical expenses. Along with this, recent changes in federal loan policies limit the use of how a student can use financial aid. Students who attend college make up a subgroup of the population who are vulnerable to setbacks that can cause tremendous damage. While the government has made attempts to address food insecurity in the K-12 school system not much effort has been made for college students. Therefore, government officials and higher education administrators should consider college food insecurity a major health priority (Patton-López et al., 2014; Maroto et al., 2015; Goldrick-Rab et al., 2018).

A study at a large mid-Atlantic university examined the association between food insecurity and the associated risk factors using a cross-sectional survey. Participants were chosen from eight courses at two universities through email announcements that included a survey link. The study had a total sample size of 237 undergraduate students. The results indicated that 15% of students were food insecure and 16% were at risk of being food insecure. A closer look reveals that 80% of students reported an inability to eat balanced meals, 69% ate less food than they felt they should, and were hungry because there was not enough money for food in the past year. Students who were food insecure or at risk of being food insecure were more likely to rate their health as fair, poor, or very poor. These students also experienced frequent signs of depression. A positive association was shown between receiving financial aid and students who were food insecure. Black students who received multiple sources of financial aid and experienced housing crisis were more likely to be food insecure or at risk of being food insecure when adjusted for age, gender, and family income. A bridge that helped students overcome food

insecurity included receiving financial support from family members (see Payne-Sturges et al., 2018).

Students at 10 higher education institutes located in Tennessee, Mississippi, North Carolina, and West Virginia were surveyed to explore the relationship between food insecurity, monthly expenditures, and coping strategies using a cross-sectional survey. Participants were recruited using student email listservs, campus-wide announcements, and flyers posted on campus. The study had a total sample of 13,642 respondents including freshmen, sophomore, junior, seniors, and graduate students. The results indicate that food insecurity ranged from 22.4% to 51.8% across all 10 campuses with an average of 30.5% of food insecure students. A subgroup analysis of 9,179 food insecure students was conducted to find predictors of food insecurity. A breakdown of food insecure students reveals that 15.5% had low food security and 15.1% had very low food security.

A significant association was shown between monthly expenditures and students who had very low food security. The monthly expenditure scale asked how often students spent their money on other items besides food. Additionally, a significant association was found between coping strategies and students who had very low food security. The coping strategy scale asked students how often they used strategies to help with being food insecure. Moreover, students who were sophomore and juniors, racial/ethnic minorities who reported their health as fair/poor, students who received financial aid, and sometimes cooked also showed an increased risk of being food insecure (see Hagedorn et al., 2019).

Next, students who attended a university in the Appalachian region were surveyed to compare food secure and food insecure students and identify predictor variables of food insecurity. Participants were recruited through email and the study had a total sample that

included 1,093 students. The results indicate that 53.8% of students were food secure and 46.2% of students were food insecure. A breakdown of the food insecure students reveals that 21.9% had low food security and 24.3% had very low food security. Students who experienced severe levels of food insecurity used a greater number of coping strategies. The higher a food insecure student scored on the coping strategy scale the higher their rate of food insecurity.

A positive association was shown between food insecure students who spent more on their monthly expenses. Food insecure students tended to spend more money on nonfood items when compared to food secure students. Along with this, students who reported their health as poor or fair were three times as likely to food insecure when compared to food secure students. Bridges that helped students alleviate being food insecure included getting a part-time or full-time job, receiving more financial aid and learning how to budget, eat healthily, and shop for food (see McArthur et al., 2018).

Lastly, a study conducted across the UT system (the University of Tennessee-Knoxville, University of Tennessee-Chattanooga, University of Tennessee-Martin, and University of Tennessee-Health Science Center) compared rates of food secure and food insecure students and identified factors associated with food insecurity using a cross-sectional survey. Participants were emailed through a campus-wide system and the study had a total sample of 4,842 students including sophomores, juniors, seniors, and graduate students. The results indicate that across all four campuses 64.4% were food secure and 35.6% were food insecure. A breakdown of food insecure students reveals that 16.1% had low food security and 19.5% had very low food security.

Students who had household food insecurity before attending a school in the UT system were more likely to be food insecure on campus. Food insecurity was also highest amongst

students who did not receive familial financial support, had part-time or full-time jobs, relied on personal savings, received loans requiring repayment, participated in meal plans, or received scholarships not requiring repayment. A closer look at a racial/ethnic breakdown reveals that Black students had higher rates of food insecurity and lower rates of food security when compared to their White counterparts across the UT system (see Wooten 2018).

Black Students' Experiences on Predominately White Campuses

Throughout U.S. history there has been an exclusion of Black people from receiving an adequate education that prepares them for the future. It was not until the 1954 *Brown v. the Board of Education* Supreme Court decision that did away with separate-but-equal educational systems for Whites, Blacks, and other racial/ethnic groups in the U.S. Though Black people have always realized the importance of receiving an education there have been barriers that prevent them from achieving success (Williamson 1999). Many negative experiences Black students deal with come from White students and White faculty members. One of the barriers for Black students is experiencing racist comments and racial insensitivity from White students. For instance, Black students have expressed that they are seen as “All Alike” which creates difficulty socializing with others on campus (Feagin 1999).

Next, White professors may view Black students as a representative of their race to explain what Black people “want” and force them to conform to a White normative model. For instance, a Black student expressed that her English professor told her to write about a universal (White) experience and to avoid writing about Black people. White professors may also not provide adequate feedback or positive reinforcement for Black students. Another barrier is the uneasiness surrounding the campus police. As Black people have negative experiences with

community policing and police brutality, they may feel uncomfortable on campus (Alexander 2011).

Moreover, Black students may face hostile or discriminatory action which includes verbal or physical aggression, exclusion, dismissal of their subculture, and racial typecasting. A mix of these issues may leave students with racial anxiety. Racial anxiety is feeling accountable for the preconceptions White people have about Black people and feeling powerless to change those preconceptions which then brings a sense of shame. Bridges that promote psychological and emotional well-being for Black students include Black student unions, Black studies departments, designated safe havens, academic advising, tutoring services, and departmental organizations that focus career readiness (see Feagin 1999; Steele 1999; Williamson 1999). Predominately White institutions need to have an understanding of the barriers Black students face to help them succeed academically and be food secure.

THEORETICAL FRAMEWORK, EXPLORATORY MODEL, AND HYPOTHESES

Theoretical Framework: Theory of Fundamental Causes

According to the theory of fundamental causes, there is a connection between socioeconomic differences and health inequalities that persist despite changes in diseases, risk factors, and improvements in the health care system. The theory is comprised of three main tenants. First, resources such as money, power, knowledge, prestige, and beneficial social connections can be used to avoid risks or minimize the consequences of a disease once it occurs. Next, fundamental causes are linked to multiple disease outcomes through numerous mechanisms. Lastly, the association between fundamental causes and disease is reproduced across time and place despite the replacement of intervening mechanisms (Link & Phelan 1995). Therefore, fundamental causes cannot be dealt with by targeting individual level risk factors.

Fundamental causes consist of but are not limited to global economic forces, the macro sociopolitical environment, political priorities and decisions, societal values to equity and fairness, and unequal distribution of income, power, and wealth, along with poverty, marginalization, and discrimination. Meanwhile, individual level risk factors include but are not limited to economics and work, physical capacity, education and learning, social and cultural norms, and access to beneficial services. The fundamental causes of health inequalities, which are often ignored by health professionals, cannot be fixed by preventing or mitigating individual level risk factors (Link & Phelan; Hatzenbuehler et al., 2013). A central point of the theory is to understand why people are exposed to risk and to identify social conditions as risk factors related to a disease or health complication. Social conditions are defined as “factors that involve a person’s relationships to other people.” (Link & Phelan 1995: 81). These social conditions

include race, socioeconomic status, gender, stressful life events, and weak social support (Link & Phelan 1995).

The theory is closely intertwined with the EJM and the FJM. Both movements have made connections between socioeconomic status, race, and unequal health outcomes. The EJM has focused its attention on health complications due to the disproportionate exposure to environmental toxins. These negative health effects include but are not limited to asthma, cancer, lead poisoning, and cardiovascular diseases (Davies & Miller 2013). While the FJM has focused its attention on the lack of control over food systems that result in limited or no access to healthy food options. These negative health effects include but are not limited to obesity, diabetes, hypertension, and coronary heart disease (Buila 2011; Davies & Miller 2013; Guthman 2014). Both the EJM and FJM use the disproportionate prevalence of diseases as evidence of environmental injustice and food injustices. When discussing environmental and food injustice there are fundamental causes that can help explain why unequal health outcomes occur for low-income people and communities of color. The combination of living near environmental toxins and a lack of access to healthy food options can lead to intersecting health problems.

Exploratory Model

The model consists of three sets of variables: primary student variables, food insecurity variables, and the dependent variable, student food insecurity at UT. The model is built on rationales and models associated with literature on food insecurity and Black student's experiences attending predominately White institutions. First, the primary student variables were identified as the sociodemographic profile of undergraduate students. These variables include students' academic year, gender, race/ethnicity, income, student athletes, and place of residency. Next, the food insecurity variables were developed to explore the barriers and bridges students

might have in overcoming food insecurity. The barriers include prior household food insecurity (PFIS), financial security (FSS), food assistance (FAS), monthly expenditures (MES), UT attachment (UT-AS), the barriers to eating healthy (BEHS), and the UT food experience (UT-FES). The bridges for food insecurity include the food coping strategies (FCSS). The last variable, student food insecurity (SFIS), examines student's level of food access. The model assumes that the food insecurity variables will affect a student's level of food insecurity. In particular, the model assumes that out of all the primary student variables, race/ethnicity will be the strongest associated variable affecting the food insecurity variables, having both indirect and direct effects on student food insecurity at UT (see Figure 1).

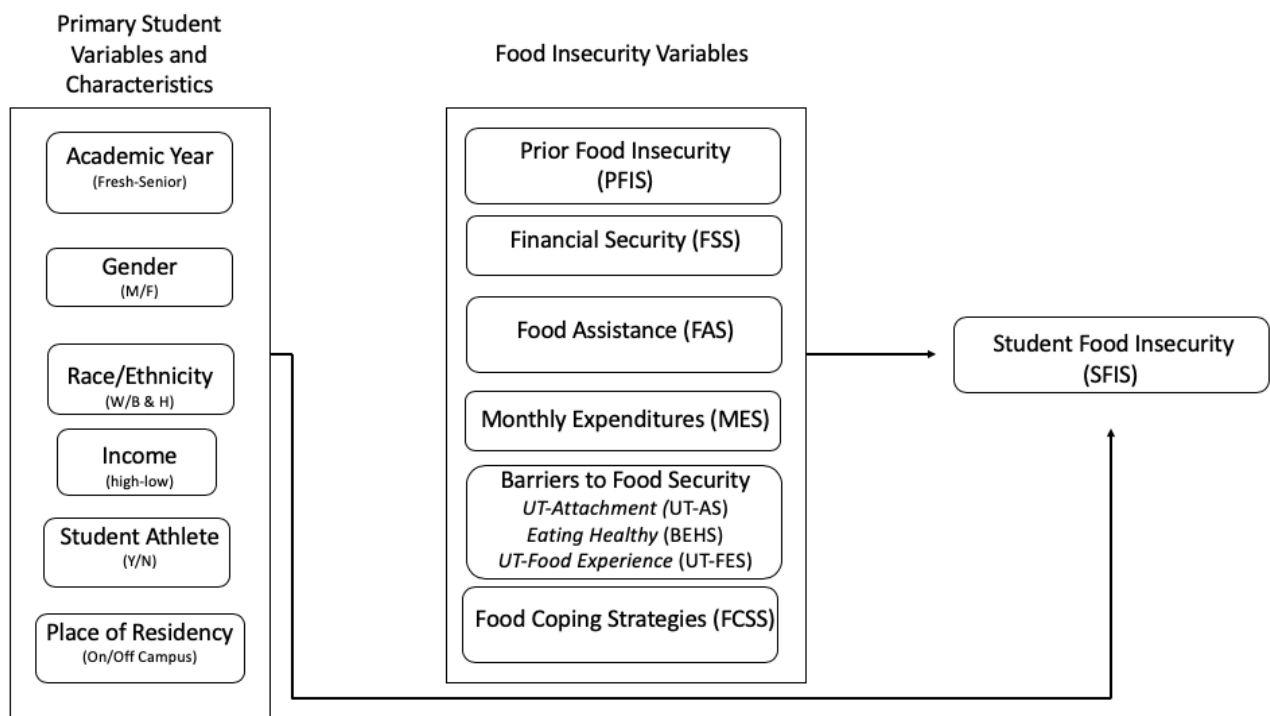


Figure 1. Exploratory Model

Hypotheses

The hypotheses outline the relationships between the primary student variables, food insecurity variables, and student food insecurity at UT that are assumed by the model and identified in the literature (see Figure 1).

H₁- Blacks and Hispanics are more likely to be food insecure than Whites.

H₂-Students living in households that were more food insecure prior to UT are more likely to be food insecure at UT.

H₃-Students who are less financially secure are more likely to be food insecure at UT.

H₄-Students who have lower monthly expenditures are more likely to be food insecure at UT.

H₅-Students who have more external barriers to food security are more likely to be food insecure at UT.

H₆-Students who use more coping strategies are more likely to be food insecure.

RESEARCH DESIGN AND METHODOLOGY

This section of the thesis provides details of the research design and methodology used in the online survey study of undergraduate students at the University of Tennessee-Knoxville. The first section describes the study area, sampling frame and recruitment procedures used in the study. The next section details the survey design followed by the data, entry, analysis, and management. The final section describes the variables used in the analysis and how the measures and scales were constructed.¹

Study Area

The online survey was conducted during the spring and summer semesters of 2020 at the University of Tennessee-Knoxville (UTK), Knoxville, Tennessee. UTK was chosen out of the four universities within the UT system (University of Tennessee-Knoxville, University of Tennessee-Chattanooga, University of Tennessee-Martin, and the University of Tennessee-Health Science Center) because it had the largest number of undergraduate and minority students. There were 20,505 full time undergraduate students enrolled at UTK during the fall semester in 2019. They were divided by the year of academic standing into freshmen (N = 4,675, or 22.8%), sophomores (N = 4,737, or 23.1%), juniors (5,085, or 24.8%) and seniors (5,782, or 28.2%). They included, White (N = 17,292, or 85.4%), Black or African American (1,252, or 6.1%), Hispanic (1,006, or 4.9%), Asian or Pacific Islander (916, or 4.4%), and American Indian or Alaska Native (39, or .04%), undergraduate students.

Sampling and Recruitment

Sampling The sampling frame was based on adult (≥ 18 years of age), full-time, undergraduate students enrolled at UTK during the spring semester and the first session of the

¹ Due to the outbreak of COVID-19 changes were made to the study.
The proposed study was going to use a paper survey and in person recruitment methods.

summer semester in 2020. Two sets of undergraduate students were sampled. One was based on students enrolled in social science courses. A total of 156 social science classes were subsequently identified from the university course catalog. They included courses in Africana Studies (12), Economics (20), Geography (16), History (13), Political Science (37), Psychology (32), and Sociology (26). These undergraduate classes were stratified by academic year in order to give equal chances that freshmen, sophomores, juniors and seniors would be represented in the final sample of survey respondents. They were also selected because they were expected to have higher enrollments of Black students and other minority students, compared to undergraduate classes in general (Carnevale et al., 2016).

The second sample of undergraduates was composed of students who are members (or affiliated with) Black student organizations or clubs at UTK. They were sampled to increase representation of Black students, and thus, represent an oversampling of this group of undergraduate students. There were 15 groups that were identified by a search of UTK websites and from the author's personal knowledge and contacts with the Black students. These students also had to be enrolled at UTK during the same time period (spring-summer semesters) to be included in this sample.

Recruitment The recruitment of students started before the spring semester. Recruitment emails were sent out to instructors of the targeted social science classes in the general sample. It explained the purpose and importance of the study, the topics covered in the survey and provided a letter of support from the chair of my thesis committee. It also asked them to forward the online survey to students enrolled in one of the targeted classes (see Appendix). Two follow up emails were sent out one week apart reminding the instructors to forward the email to their students.

Representatives of the 15 Black student organizations and clubs were contacted by an email sent by the author prior to the spring semester. It explained the purpose and importance of the study, the topics covered in the survey, and provided a letter of support from the chair of the author's thesis committee (Dr. Jones). It asked them to provide the author with a list of classes their members were planning to be enrolled in during the spring semester. It also asked them to forward the online survey to their members. Two follow-up emails were sent out to them, one week apart, reminding them to forward the survey to their members. Similar procedures were implemented in the second wave of recruitment during the summer semester. However, a survey flyer was also included in the email sent to course instructors and they were reminded to send out the survey to students by a series of telephone calls and emails to representatives of Black student organizations were also sent the flyer and similarly reminded.

An incentive was offered to students participating in the online survey during both semesters to increase survey responses. The original incentive was five \$10 gift cards but was increased to \$15 gift cards during the summer semester due to very low response rates. The incentive was changed so that respondents who participated either in the spring or summer semesters were eligible to participate in a random lottery of ten \$15 gift-cards.

Survey Design

The framework used to develop the survey was built upon previous studies of food insecurity among college students (Bruening et al., 2016; Maroto et al., 2015; Wooten 2018), and the literature on food insecurity, urban food deserts, and financial security in the United States (Coleman-Jensen et al., 2019; Pew Research Center 2015, see Jones et al., 2020). Survey items were based on questions used in these studies but especially those that found a relationship between food insecurity and college students. Other questions were developed from my own

knowledge and understanding of the UTK campus, its culture and food environment, as well as potential barriers that prevent students from eating healthy. The survey was pretested and evaluated by 26 students enrolled in an undergraduate sociology class, and by thesis committee members. The survey was originally designed to be administered in classes using a paper and pencil format. However due to the coronavirus pandemic, it was conducted online using the survey instrument, Question Pro.

The introduction to the survey included a greeting that welcomed students and provided information about the study. This was followed by the consent form that students were encouraged to read and participation in the survey constituted their informed consent. The end of the survey provided a statement thanking them and provided instructions on how to enter the lottery drawing for the gift cards. The body of the survey contained mostly closed-ended questions and response categories. Many of the of them were used to tap into various beliefs, attitudes, and behaviors associated with student food insecurity. The last set of questions ask respondents about their sociodemographic conditions and characteristics.

The final survey had a total of 55 questions (see Appendix). The first set of questions (Q2-7) asked students about their experience at the University of Tennessee, their health, diet and views about aspects of its on-campus food environment and food outlets. The next set of questions (Q8-20), asked them about their food access and eating practices before attending college, before UT went to online classes due to the coronavirus pandemic, and after it went to online classes. Q21a-Q22f, asked them how they were coping before and after UT went to online classes. Q23-24, asked students about their monthly expenditures and Q25 asked students about food coping strategies used when running low on food. Questions 26-45 asked students about their sociodemographic characteristics, financial security, and reliance on food assistance

programs. The last set, Q47-54 were administrative questions that helped identify students by department. The final survey question (Q55) asks students to provide comments on the survey.

Data Entry, Analysis, and Management

The data obtained from the survey were entered directly into IBM SPSS Version 26, a statistical software package used for the social sciences. Descriptive statistical analyses were performed to estimate the central tendency and variability for each variable in the model predicting student food insecurity and to identify any possible errors or concerns in the data. All survey items, and scales (except for the scale items related to monthly expenditures) were coded so that higher scores on them would be associated with greater student food insecurity. Lower student scores on the monthly expenditures scale would be associated with greater food insecurity. All recoded variables were checked for accuracy and correspondence to the original un-recoded item or variable. Item analyses were performed on each scale item and tests of reliability (i.e., Cronbach's Alpha) were performed on each scale to evaluate its internal consistency. A series of Pearson's (bivariate) correlation analyses were conducted between the sociodemographic variables, food insecurity variables, and the dependent variable, *Student Food Insecurity Scale* (SFIS) proposed in the model. These analyses were also used to assess model's six hypotheses. Multiple linear regression analysis was conducted to predict SFIS with the variables found significantly correlated to SFIS.

Access to the digital records of all survey participants was limited to the project's principal investigator (Bryan Clayborne) and faculty advisor (Dr. Jones). There is no links between the questionnaire and survey participants. After completion of the online survey participants were redirected to another webpage to be included in the gift card drawing. All

survey responses were kept on a computer using an encrypted file with password protection. Data related to this project will only be made available to persons conducting the study.

Measures and Scale Construction

Sociodemographic Variables The sociodemographic variables were used to evaluate the sample characteristics of the survey with the undergraduate student population in general. They also represent the most distal set of variables in the model of food insecurity. All of them except, ‘Student Athlete,’ had been used in past studies of college food insecurity. It was included because it was discovered that many student athletes at UT are provided on-campus meals and health and nutrition guidance. Consequently, ‘Student Athlete’ served as a control variable. The survey questions used to construct these sociodemographic variables are presented in Table A-1.

Gender (female = 0; male = 1), Race/Ethnicity (non-Hispanic Whites = 0, Blacks and Hispanics = 1); Student Athlete (‘yes’ = 0 ‘no’ = 1) and Place of Residency (‘on campus’ = 0; ‘off campus’ = 1) were recoded into dummy variables. Academic year was based upon student status (freshman-1, sophomore-2, junior-3, and senior-4). The five-response ‘Income’ question was based on the student’s personal monthly income excluding money given by parents and financial aid. Scores on ‘income’ were reversed coded from ‘more than \$2000 per month (1) to ‘less than \$500 (5). All other responses to these sociodemographic questions were placed into ‘missing values’ and excluded from the analysis (see Table A-1).

Food Insecurity and Student Food Insecurity Scales

Student Food Insecurity Scale (SFIS) Student food insecurity was estimated using the 11-item U.S. Adult Food Security Module (USDA 2012) and tailored to suit undergraduate students and to the environment existing prior to the coronavirus outbreak and after classes going online. Each of the item responses were coded so that higher scores reflected greater student food

insecurity. Five items listed specific food-insecure conditions caused by a lack of money or resources (i.e., eating less, reducing the size of meals, skipping meals, losing weight or going hungry). These items were recoded into dummy variables (no = 0; yes = 1) so that those students who were faced with these conditions were more likely to be experiencing greater food insecurity. Other questions were multiple response items and asked students about food their availability, the frequency of reducing food intake, and worrying about running out of food. Items were recoded so that higher scores on the 11-item, *Student Food Insecurity Scale* (SFIS) reflected greater food insecurity. Item analysis was performed on each scale item and a test of reliability (i.e., Cronbach's Alpha) was performed on the SFIS to evaluate its internal consistency (see Tables A- 2-A & 2-B).

Prior Food Insecurity Scale (PFIS) The prior food insecurity measure is based on two items from the U.S. Adult Food Security Module (USDA 2012) that were changed to reflect conditions before students attended UT. The two items tapped into how often ('often-never') they worried about food running out in their households and not having enough money to buy more. Items were recorded so that higher scores reflect more worry and greater household food insecurity before UT. Although there were only two items, a test of reliability (i.e., Cronbach's Alpha) was nevertheless performed on the SFIS to evaluate its internal consistency (see Table A-3).

Financial Security Scale (FSS) The financial security scale is based on several items developed by the Pew Research Center (2015) and others developed by the author. The 6-item scale was designed to determine the student's level of financial security while away at college (see Table A-4). Questions asked respondents about having a checking and savings accounts, a credit card, health insurance, and owning or having regular access to a car. Higher scores on the

scale reflected greater financial insecurity. Students who responded “yes” to these set of questions were coded (0); ‘no’ responses were coded (1). Item analysis was performed on each scale item and a test of reliability (i.e., Cronbach’s Alpha) was performed on the FSS to evaluate its internal consistency (see Table A-4).

Food Assistance Scale (FAS) The 4-item scale was designed to determine if the student and/or members of their household, were enrolled in food assistance programs such as the Supplemental Nutritional Assistance Program (SNAP, formerly food stamps). Higher scores on the scale reflected greater financial insecurity. Students who responded “yes” to these set of questions were coded (1); ‘no’ responses were coded (0). Item analysis was performed on each scale item and a test of reliability (i.e., Cronbach’s Alpha) was performed on the FAS to evaluate its internal consistency (see Table A-5).

Monthly Expenditures Scale (MES) The monthly expenditure scale is based on a scale used in a prior study of college food insecurity (see Wooten 2018). The 5-item scale is designed to determine student’s average monthly cost for groceries, eating out, transportation, shopping for non-food items, and entertainment (see Table A-6). Each question employed a Likert response option ranging from “\$0” to “More than \$200”. Items were recorded so that the higher scores on the scale reflected *lower* average monthly expenditures. Item analysis was performed on each scale item and a test of reliability (i.e., Cronbach’s Alpha) was performed on the MES to evaluate its internal consistency (see Table A-6).

Potential Barriers to Student Food Security

Three measures were used to examine barriers that could increase the likelihood of experiencing food security among students. One was based on their feelings of belongingness and attachment to UTK. A second measure was based on their views about things that could prevent

them from eating a healthy diet. The third measure examined their experiences obtaining food from dining halls, restaurants, and other food outlets on the UTK campus.

The first measure, *UT Attachment Scale* (UT-AS), is a 7-item scale using Likert response options ranging from “Strongly Agree” (1) to ‘Strongly Disagree’ (5) which estimated the extent students felt they belonged and were emotionally attached to UTK (e.g., “I feel welcome at UT”; “UT reflects my values and the kind of person I am”). Items were coded so higher scores on the scale represented weaker sense of belonging/attachment to UTK (see Table A-7-A).

The second measure, *Barriers to Eating Healthy Scale* (BEHS), was based on an 11-item scale used to determine student’s perceptions of barriers that could prevent them from eating a healthy diet (e.g., “lack of knowledge on how to eat healthy”; “lack of healthy and affordable food options”, see Table A-7-A). Each scale item employed a Likert response option ranging from “Not at all” (1) to “A Great Deal” (5). Items were recorded so that higher scores on the scale reflect greater perceived barriers to a healthy diet (see Table A-7-A).

The third barrier measured, *UT Food Experience Scale* (UT-FES), was a 4-item scale used to gauge perception of obtaining food at various places students could obtain food on campus (e.g., dining halls, PODS, restaurants and other privately-operated food outlets). Responses could range from “Very Positive (1) to Very Negative (5) and higher scores on the scale reflect negative food experiences. Responses of students who never obtained food from each place were placed in ‘missing values’ and excluded from the scale and from further analysis. Finally, item analysis was performed for each of these ‘Barrier scales’ and tests of reliability (i.e., Cronbach’s Alpha) were performed to evaluate each scale’s internal consistency (see Table A-7-B).

The last scale used to predict student food insecurity, *Food Coping Strategies Scale* (FCSS), was based on a 7-item scale using Likert response options ranging from “Never” (1) to “Often” (3). It estimated the frequency students used these strategies when they were running low on food (e.g., cutting back on other expenses, borrowing money). Higher scores on the scale reflect greater frequency of using these behavioral strategies. Item analysis was performed on each scale item and a test of reliability (i.e., Cronbach’s Alpha) was performed on the FCSS to evaluate its internal consistency (see Table A-8).

RESULTS

This study was conducted to examine factors influencing student food insecurity among social science students at UTK. This chapter presents the descriptive and inferential statistical results from the data collected from the online survey. The results are divided into four sections. The first section gives the descriptive results of the sociodemographic variables and provides a profile of the undergraduate student respondents. The second section gives the descriptive results of student's responses to the food insecurity variables and the dependent variable, student food insecurity (*Student Food Insecurity Scale*; SFIS). The next section provides the correlation results between the sociodemographic variables, food insecurity variables, and the SFIS. It also provides an assessment of the model's six hypotheses. The last section presents the findings based on a Multiple Linear Regression analysis of the measures found significantly ($p < .05$) related to SFIS on the bivariate level.

Sociodemographic Characteristics of the Survey Respondents

Most of the students were seniors (36.9%) followed by juniors (29.6%), sophomores (18.4%), and freshmen (15%; see Table A-10). Most (68.3%) identified as female; the rest male (31.7%). More than 7 out of 10 students (74.4%) described themselves as White, a few (10.6%) described themselves as Non-Hispanic Black or African American, and the rest described themselves either as Asian (6.8%), Hispanic (5.8%), American Indian/Alaskan Native (1.4%), or Native Hawaiian/Other Pacific Islander (1.0%). The student's income ranged from less than \$500 to more than \$2,000 per month. A majority of students (57.5%) had incomes below \$500 followed by \$501-1,000 (27.5%), \$1,001-1,500 (8.2%), \$1,501-2,000 (1.9%), and more than \$2,000 (4.8%). Very few (4.8%) of students reported being a student athlete most of the students (95.2%) indicated that that they were not a student athlete. Lastly, over half of the students

(69.7%) lived off-campus meanwhile 30.3% of students lived on campus. Most of the sociodemographic characteristics consists of upper division students who are mostly women, White, and have less than \$500 per month. Most of the students are not involved in any campus athletic teams and they live off-campus (see Table A-10). Next, descriptive results will be examined for the food insecurity variables listed in the exploratory model.

*Descriptive Results: Student Responses to the
Food Insecurity Variables and the SFIS*

The food insecurity variables include eight (8) scales used to understand the barriers and bridges of student food insecurity. This section of the results follows the order of food insecurity variables presented in the exploratory model (see Figure 1 and Table A-9).

For the *Prior Food Insecurity Scale* (PFIS), when asked how often their household worried about running out of food before they got money to buy more 76.2% of students reported “never”, followed by “sometimes” (18.7%), and “often” (5.1%). Similarly, when asked how often their household ran out of food and there was not enough money to buy more food 81.7% of students reported “never”, followed by “sometimes” (15.0%), and “often” (3.3%). Consequently, most of the students did not have household food insecurity prior to attending UT and were not worried or concerned with running out money to buy more food.

For the *Financial Security Scale* (FSS), 85.9% of students either own or have access to a car on a regular basis. Eight (8) out of 10 (84.5%) students reported having health insurance. Most (80.2%) of the student reported having a saving account. Almost all (97.1%) of students had checking accounts. Lastly, most (60.2%) of students had a credit card. Overall, most of the students were financially secure according the scale.

For the *Food Assistance Scale* (FAS), 91.8% of student did not receive food assistance from the Supplemental Nutritional Program (SNAP). Similarly, 93.2% of students did not

receive help from the National School Lunch Program and 96.6% did not receive help from the Women, Infants, and Children (WIC) program. A majority (97.6%) of students did not receive help from the Head Start Program. Therefore, most of the student's households did not receive assistance from any of the largest government programs in the last 12 months.

For the *Monthly Expenditure Scale* (MES), a few (25.4%) students spent between \$51-100 for groceries followed by \$101-200 (20.6%). For eating out, 38.6% of students spent between \$1-50 followed by \$51-100 (31.4%). A majority (42.8%) of students spent between \$1-50 shopping for clothes, shoes, and other items followed by \$0 (31.3%). For transportation, 39.4% of students spent between \$1-50 followed by \$51-100 (24.0%). Lastly, half (50.7%) of students spent between \$1-50 for entertainment followed by \$0 (21.5%). Accordingly, most of the student's spent between \$1-100 a month for their monthly expenses.

For the *UT Attachment Scale* (UT-AS), when asked if students missed UT when they were away from it too long 67.1% agreed and 16.9% disagreed. Most (58.7%) of students had an emotional attachment to UT; whereas, a few (23.8%) did not. Four (4) out of 10 (48.3%) of students felt that UT reflects their values and the kind of person they are; a few (17.4%) did not. Thus, most of the student had an attachment to UT.

For the *Barriers to Eating Healthy Scale* (BEHS), when asked if a lack of time prevented students from eating a healthy diet 28.8% of students reported "somewhat" followed by "quite a bit" (38.0%). A few (27.5%) students felt that a lack affordable healthy food options prevented them "somewhat" from a healthy diet followed by "quite a bit" (25.8%). When asked if a lack of healthy options on campus prevented them from eating healthy 29.1% of student reported "somewhat" followed by "quite a bit" (28.2%). Lastly, when asked if a lack of healthy food options off campus prevented them from eating healthy 32.8% of students reported "somewhat"

followed by “quite a bit” (19.2%). Overall, out of all the barriers to eating healthy a lack of time prevents students the most.

For the *UT Food Experience Scale* (UT-FES), when asked about their experience getting food from on campus dining halls 44.6% of student reported having a positive experience followed by 15.4% of students who had a negative experience. For Provisions on Demand (P.O.D) convenient food stores, 48.3% of students reported having a positive experience and 10.0% of students reported having a negative experience. Lastly, over half (51.3%) of student had a positive experience at Chick-Fil-La and a few 6.7% had a negative experience. Consequently, most of the students reporting having a positive experience receiving food from on campus restaurants and convenient stores.

For the *Food Coping Strategies Scale* (FCSS), when asked if students borrowed money from family or friends when food was running low 51.9% of students reported “never”, “sometime” (31.7%), and “often” (16.3%). Most (51.7%) of the students split the cost of food some of the time followed by “never” (34.0%) and “often” (14.1%). Six (6) out of 10 (60.8%) students reported never taking food from an on-campus dining hall followed by “sometimes” (23.4%), and “often” (15.8%). Therefore, one of the major coping strategy students use when running low of food is splitting food cost with their friends.

For the *Student Food Insecurity Scale* (SFIS), 48.9% of students had enough, but not always the kinds of foods they wanted to eat, 43.9% of students had enough of the kinds of food they wanted to eat, and only 6.8% did not have enough food some of the time. Most (61.8%) of students did not worry about food running out, 28.6% worried some of the time, and 9.5% worried often. When asked if the food they bought just did not last and they did not have money to buy more 63.0% reported “never” followed by “sometimes” (29.7%), and “often” (7.3%).

Half (50.0%) of the students could afford to eat balance meals, 33.5% could some of the time, and 16.5% often could not eat balanced meals. Three (3) out of 10 (35.0%) students cut the size of their meals or skipped meals because there was not enough money for food. Moreover, when asked how often this occurred 44.2% of students reported doing so for some months, but not every month, 31.2% of students reported doing so almost every month, and 24.7% of students reported doing so for only one or two months. Three (3) out of 10 (35.5%) students eat less than they felt they should because there was not enough money for food. Food insecure students (23.9%) were hungry but did not eat because there was not enough money for food. A few (17.1%) of students lost weight because there was not enough money for food. A small minority (9.1%) of student reported not eating for a whole day. When asked how often this occurred 47.4% of students reported doing so for some months, but not every month, and 26.3% of students reported doing so almost every month or for only one or two months (see Table A-11).

Consequently, most of the students had access to food. Students who were food insecure reported cutting or skipping meals, eating less food than they felt they should, and some lost weight because there was not enough money for food. Table A-12 provides estimates of student food security and food insecurity by race and ethnicity. Here we find that out of all respondents 71.5% of students were food secure and 28.5% of students were food insecure. Black and Hispanic (36.4%) students were more food insecure than their White (26.1%) counterparts. Out of all the students, Hispanic (41.7%) students had the highest rate of food insecurity.

*Bivariate Results: Sociodemographic and
Food Insecurity Variables with SFIS*

Next, we present the findings based on the Pearson (bivariate) correlation analyses conducted between the sociodemographic variables, food insecurity variables, and the dependent variable, *Student Food Insecurity Scale* (SFIS).

Sociodemographic Variables Race/ethnicity and student income have been found in the studies examining student food insecurity at college. Both were explored in the study (see Figure 1) along with academic year, gender, being a student athlete and place of residency. In particular, it was assumed that upper-division students, Blacks and Hispanics, women, students with lower incomes, non-student athletes, and off-campus students have greater food insecurity than Whites, higher income students, student athletes, and those who lived on-campus.

Only personal income and race/ethnicity were found to have a significant relationship with SFIS (see Table A-13). Here we find students with less personal income are more likely to be food insecure ($r = .128, p < .05$). There also was a tendency for Blacks and Hispanic students to be greater food insecure than Whites ($r = .099, p < .10$). The variables academic year, gender, student athlete, and residency were not related to student food insecurity.

Food Insecurity Variables There were eight (8) scales used to explore relationships with student food insecurity. All of them except, the *Food Assistance Scale* (FAS) were originally proposed in the model. FAS was added due to the low reliability of the *Financial Security Scale* (FSS).

All eight scales were found positively related to student food insecurity (SFIS-see Table A-13). The two strongest are the *Food Coping Strategies Scale* (FCSS, $r = .537, p < .001$) and the *Prior Food Insecurity Scale* (PFIS, $r = .424, p < .001$). Consequently, students who use more coping strategies when they are running out of food and who were living in food insecure household prior to coming to UT are more likely to be food insecure at UT. The three ‘Barriers to Food Insecurity’ scales were also significantly related ($p < .001$) to SFIS. Students who felt less attached to UT (*UT-AS*, $r = .280$), view UT food outlets more negatively (*UT-FES*, $r =$

.378), and faced barriers to healthy eating (*Barriers-Eating Healthy Scale (BEHS)*, $r = .387$) are more likely to be food insecure at UT.

The three other ‘Barrier’ measures have weaker and less significant ($p < .10$) relationships with the SFIS. For example, those who are enrolled in food assistance programs such as SNAP and WIC, or who have other members of their household enrolled in them, are more likely to be food insecure at UT (*FAS*, $r = .112$). Students with lower monthly expenditures (*MES*, $r = .106$) on such things as eating out, shopping, and entertainment, and who are less financially secure (*FSS*, $r = 0.95$), also tend to be food insecure. For instance, less-financially secure students are more likely not to have savings and checking accounts, a credit card, health insurance, and access to a vehicle.

Correlational Assessment of the Model Hypotheses

The six hypotheses were developed to test the exploratory model to determine predictor variables for student food insecurity. The first hypothesis states that Black and Hispanics students are more likely to be food insecure than Whites. We found that race/ethnicity had a significant relationship with the SFIS however, it was weak, and was at a very low level of statistical significance ($p < .010$). The second hypothesis states that students whose households were more food insecure prior to UT are more likely to be food insecure at UT. We found that prior food insecurity was one of the strongest variables linked to student’s food insecurity. The third hypothesis states that students who are less financially secure are more likely to be food insecure at UT. We found a positive, but weak relationship at a very low level of significance ($p < .10$).

The fourth hypothesis states that students who have lower monthly expenditures are more likely to be food insecure at UT. We found that students who spent less on monthly expenditures

such as eating out, shopping, and entertainment were more likely to be food insecure. The fifth hypothesis states that students who perceive they have more external barriers are more likely to be food insecure at UT. We found that students who had weak attachment to UT, perceive more barrier to eating healthy, and had negative food experiences at UT food venues, were more likely to be food insecure. Last, the sixth hypothesis states that students who use more coping strategies are more likely to be food insecure. We found that food coping strategies had the strongest relationship with student food insecurity. Overall, most of the hypotheses in the model were moderately supported by the data.

Multiple Linear Regression Results: Food Insecurity Variables and the SFIS

The final examination of student food insecurity was based on multiple linear regression analysis of the sociodemographic and food insecurity variables found significantly ($p < .05$) related to SFIS on the bivariate level. They included: personal income variable and the five scale-variables (FCSS, UT-FES, BEHS, PFIS, UT-AS). A stepwise procedure was used to select variables in the final regression equation and *beta* weights were used to determine the relative strength of each variable for predicting student food insecurity (SFIS- see Table A-14).

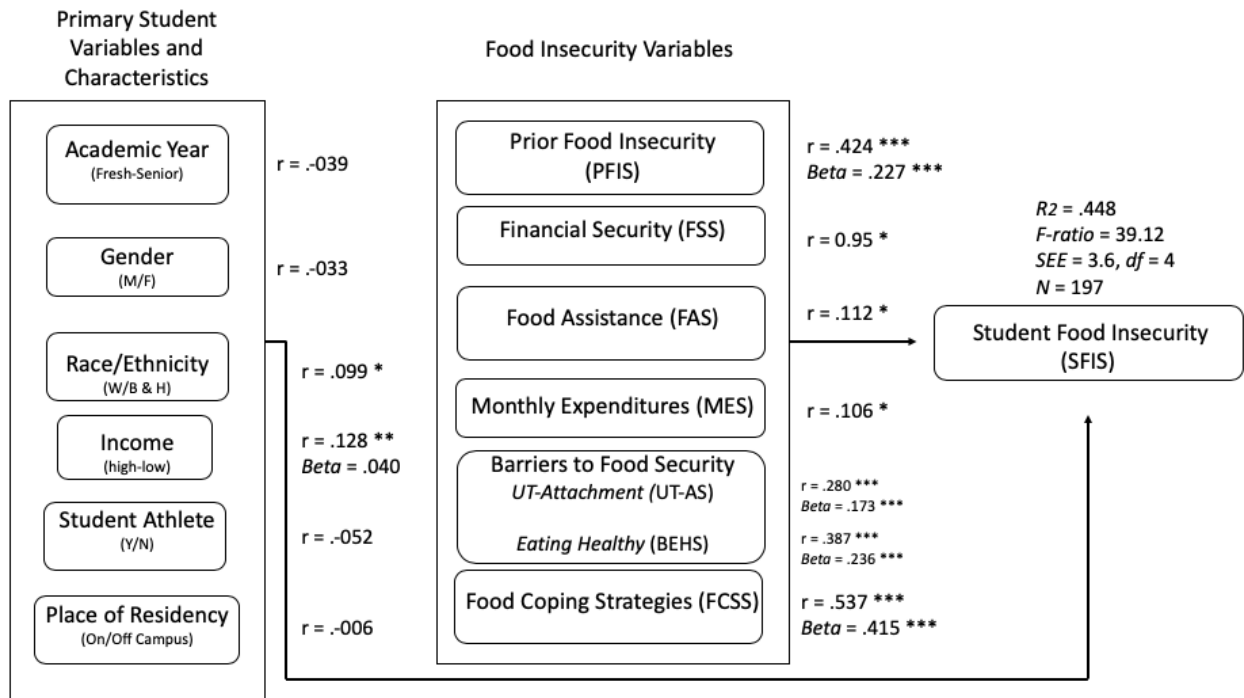
We ran two models. The first model includes the five scales listed above and income; the second model excluded UT-FES which tapped into the students experience of eating at UT food outlets (see Methods). This was necessary because it significantly reduced the number of cases included in the regression analysis from 197 to 138. This was due to the many students who did not obtain food from all four of the food outlets.

The first multiple regression model included UT-FES (see Table A-14). The analysis indicates four of the six measures were significant predictors of SFIS---and at high levels (FCSS, UT-FES, BEHS, PFIS). UT-AS and personal income were not significant predictors of SFIS.

The strongest predictor was FCSS. Together, the four variables explained about 55% of the variance in the dependent variable, SFIS. Thus, knowledge of the food coping strategies, food experiences at UT, perceived barriers to eating healthy and prior food insecurity in students' households provided a reasonably good understanding of their level of food insecurity.

The second multiple regression model excluded UT-FES (see Table A-15). This analysis indicates four of the five measures were significant predictors of SFIS---and at high levels (FCSS, BEHS, PFIS, UT-AS). Personal income was not a significant predictor of SFIS. The strongest predictor was FCSS. Together, the four variables explained about 45% of the variance in the dependent variable, SFIS. Thus, knowledge of the food coping strategies, perceived barriers to eating healthy, prior food insecurity, and student's attachment to UT, provided a reasonably good understanding of their level of food insecurity.

Figure 2 presents the summary bivariate and multivariate results. Out of all the primary student variables and characteristics race and income had a significant relationship with the dependent variable, SFIS. However, the relationship between race and SFIS is relatively weak. All the food insecurity variables were significantly related to SFIS. The best predictors of student food insecurity include food coping strategies and prior food insecurity to UT.



Significance * $p < .10$; ** $p < .05$; *** $p < .01$

Figure 2. Summary Results-Bivariate and Multiple Regression Analysis

CONCLUSION

This thesis explores the barrier and bridges of food insecurity among undergraduate students taking social science courses at the University of Tennessee. The study was carried out by an online survey given to students during the spring and summer semesters of 2020. An exploratory model was developed from a review of the literature on food insecurity. The model and its assumptions were then tested using six hypotheses. The predictor variables of student food insecurity in the model included prior household food insecurity, financial security, food assistance, monthly expenditures, UT attachment, barriers to eating healthy, UT food experience, and the use of food coping strategies. Each of these variables was identified throughout the literature as being a possible barrier preventing people from accessing food.

Most of the sample consisted of upper division students who were women, White, had less than \$500 per month, lived off-campus, and were not student athletes. The findings indicate that 48.9% of students had enough, but not always the kinds of foods they wanted to eat. Only half (50.0%) of students could afford to eat balanced meals. Food insecure students also cut or skipped meals, ate less than they felt they should, and some students lost weight because there was not enough money for food. Moreover, Black and Hispanic (36.4%) students were more likely to be food insecure than their White (26.1%) counterparts. Hispanic (41.7%) students had the highest rate of food insecurity out of all respondents. The Pearson's correlation reveals that food insecurity is associated with previous household food insecurity, less financial security, food assistance use, fewer monthly expenditures, lack of attachment to campus, negative experiences receiving food on campus, more perceived barriers to healthy eating, and the use of food coping strategies. An assessment of the six hypotheses, reveals that most hypotheses were supported by the research findings. The variable, race, which was assumed to be the strongest

indicator of food insecurity had a weak relationship with student food insecurity. The multiple linear regression shows that the strongest predictors of student's food insecurity were previous household food insecurity and the use of food coping strategies when running low on food.

Previous studies on college food insecurity indicated that there was a relationship between monthly expenditures, previous household food insecurity, and the use of coping strategies (Hagedorn et al., 2019; McArthur et al., 2018; Wooten 2018). Food insecure students tended to spend more money on nonfood items when compared to food secure students (see Hagedorn et al., 2019; McArthur et al., 2018). The results of this study indicate that food insecure students spent less on monthly expenditures. While the previous studies asked students how often they spent their money on nonfood items, it is important to note that food insecure students may not have any financial resources to pull from. Next, Wooten (2018) found that previous household food insecurity was related to food insecurity on campus. The results from this study support the claim that students who leave food insecure households are more likely to be food insecure on campus. Lastly, an association was found between food insecure students and the use of coping strategies (Hagedorn et al., 2019; McArthur et al., 2018). The claim that food insecure students use more food coping strategies when running low on food is supported by the results from this study.

Next, the theory of fundamental causes states that macrolevel issues produce unequal health outcomes despite improvements in the health care system. It argues against using individual level risk factors such as work life or physical capacity as the only measures to address health inequalities. From the results, we see that out of all the sociodemographic variables income and race had a significant relationship with the student food insecurity scale. The relationship between income and the SFIS was stronger than the relationship between race

and the SIFS. This could be an indication that socioeconomic status may be a sign of a broader issue on campus when trying to access food. In the future, more time would be spent towards better understanding the theory and all its many facets. A larger sample size and mediation analysis could help explain away the racial differences in each food insecurity variable. This would allow for an accurate depiction of how race affects student food insecurity. Moreover, a lack of access to food leads to malnourishment or to the consumption of unhealthy food options which can cause health complications. Food insecurity needs to be further analyzed using the theory of fundamental causes as access to food is determined by global economic forces, the macro sociopolitical environment, political priorities and decisions, societal values to equity and fairness, and unequal distribution of income, power, and wealth, along with poverty, marginalization, and discrimination.

The biggest limitation of the research project was collecting survey responses during the outbreak of COVID-19. This required the project to undergo a methodical change from an in-person survey to an online survey using QuestionPro. Therefore, access to undergraduate students was limited as survey responses were dependent upon course instructors and Black organizational leaders sharing the survey flyer. Other limitations include the respondents not being randomly selected, having a low response rate, and low reliability of the financial security scale. Because of the low response rate, the results should be taken with caution. The sample size is not reflective of all the students who attend the university. The students were also selected from courses in the social sciences as a way to limit the target population for recruitment measures (Carnevale et al., 2016). In the future, to improve the generalizability of the results and randomization of the sample, the survey would have been sent to every student at UT allowing for equal exposure to the survey.

In addition to this, most of the students had access to food, but not always the kinds of food they wanted to eat. From the results we know that there are a minority of students on campus who suffer from food insecurity. While the government has made attempts to address food insecurity in the K-12 school system, little has been done to address college food insecurity and their housing crisis. Moreover, the combination of new public policy, support from higher education institutes, and better access to alternative food systems would help students have access to nutritious and safe food. In the future, universities should consider lowering food prices on campus and providing more flexible payment plans for students. Universities should also offer more culturally acceptable food for students on campus. The expectation for students to leave home and adjust to new and limited food options they may not have eaten before can leave students food insecure. In particular, the University of Tennessee-Knoxville should cut ties with Aramark, one of the largest providers of food services to prisons. As Black and brown people are disproportionately incarcerated in the U.S., students may not feel welcomed eating food that had ties to the prison system (Alexander 2011). Lastly, universities should consider creating workshops on healthy eating, cooking, and budgeting. This may help students learn how to eat healthily and develop a positive relationship with food.

The results of this thesis contribute to environmental sociology, health science, and research on college food insecurity. The exploratory models offer a starting point to examine the predictors that might influence college students' level of food insecurity. Each predictor variable offers insights into how universities and colleges might address student food insecurity. By viewing student food insecurity as a public health concern, it will increase policymakers and social justice advocates awareness of a lesser studies population. There should be fewer barriers,

such as a lack of access to food, for students to become successful as they work towards obtaining their college degree.

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APPENDIX

Table 1. Sociodemographic Characteristics

QUESTIONS	RESPONSE OPTIONS & CODING
26. What is your student status?	1. Freshman 2. Sophomore 3. Junior 4. Senior 5. Graduate Student*
28. Do you live:	1. On-campus (0) 2. Off-campus (1) [Recoded into Dummy Variable]
30. Are you a student athlete?	1. Yes (0) 2. No (1) [Recoded into Dummy Variable]
34. How much would you estimate your personal monthly income to be? (Excluding money given by parents and financial aid)?	1. Less than \$500 2. \$501-1000 3. \$1,001-1,500 4. \$1,501-2,000 5. More than \$2,000 per Month [Reverse coded]
42. Your gender is:	1. Female (0) 2. Male (1) 3. Other, please specify* [Reverse coded: Dummy Variable]
45. What is your race/ethnicity?	1. American Indian/Alaskan Native* 2. Asian* 3. Native Hawaiian/Other Pacific Islander* 4. Non-Hispanic, Black or African American (1) 5. Non-Hispanic, White (0) 6. Hispanic (1) [Recoded into a Dummy Variable]

*Responses placed in 'missing values' and excluded from further analysis.

Table 2-A. Student Food Insecurity Scale (SFIS)

QUESTIONS	RESPONSE OPTIONS & CODING
8. Which statement best describes the food available to you in the past 12 months prior to the coronavirus outbreak and UT classes going online?	1. Enough of the kinds of food I wanted to eat 2. Enough, but always the kinds of food I wanted to eat 3. Sometimes not enough food to eat 4. Often not enough food to eat
9. Please tell me how often you have done the following things in the last 12 months prior to the coronavirus outbreak and UT classes going online?	1. Often (3) 2. Sometimes (2) 3. Never (1) [Reverse coded]
9a. I worried whether my food would run out before I got money to buy more.	
9b. The food I brought just didn't last, and I didn't have money to get more.	
9c. I couldn't afford to eat balanced meals.	
10. In the last 12 months prior to the coronavirus outbreak and UT classes going online, did you ever cut the size of your meals because there was not enough money for food?	1. Yes (1) 2. No (0) [Reverse coded]
11. How often did you cut the size of your meals or skip meals because there was not enough money for food in the last 12 months prior to the coronavirus outbreak and UT classes going online?	1. Almost every month 2. Some months, but not every month 3. Only one or two months [Reverse coded]
12. In the last 12 months prior to the coronavirus outbreak and UT classes going online, did you ever eat less than you felt you should because there was not enough money for food?	1. Yes (1) 2. No (0) [Reverse coded]
13. In the last 12 months prior to the coronavirus outbreak and UT classes going online, were you ever hungry but did not eat because there was not enough money for food?	1. Yes (1) 2. No (0) [Reverse coded]
14. In the last 12 months prior to the coronavirus outbreak and UT classes going online, did you lose weight because there was not enough money for food?	1. Yes (1) 2. No (0) [Reverse coded]

Table 2-B. Student Food Insecurity Scale *(continued)*

QUESTIONS	RESPONSE OPTIONS & CODING
15. In the last 12 months prior to the coronavirus outbreak and UT classes going online, did you ever not eat for a whole day because there was not enough money for food?	1. Yes (1) 2. No (0) [Reverse coded]
16. Prior to the coronavirus out and UT classes going online, how often did you not eat for a whole day because there was not enough money for food?	1. Almost every month 2. Some months, but not every month 3. Only one or two months [Reverse coded]

Table 3. Prior Food Insecurity Scale (PFIS)

QUESTIONS	RESPONSE OPTIONS & CODING
19. Before attending UT, how often did you or any member of your household worry about running out of food before you got money to buy more?	1. Often (3) 2. Sometimes (2) 3. Never (1) [Reverse coded]
20. Before attending UT, how often did the food you had in your household run out and there was not enough money to buy more?	1. Often (3) 2. Sometimes (2) 3. Never (1) [Reverse coded]

Table 4. Financial Security Scale (FSS)

QUESTIONS	RESPONSE OPTIONS & CODING
36. Do you own or have access to a car on a regular basis?	1. Yes (0) 2. No (1) [Reverse coded]
37. Do you currently have health insurance?	1. Yes (0) 2. No (1) [Reverse coded]
38. Do you have a savings account?	1. Yes (0) 2. No (1) [Reverse coded]
39. Do you have a checking account?	1. Yes (0) 2. No (1) [Reverse coded]
40. Do you have a credit card?	1. Yes (0) 2. No (1) [Reverse coded]

Table 5. Food Assistance Scale (FAS)

QUESTION	RESPONSE OPTIONS & CODING
41. Did you or anyone in your household receive food assistance from the following programs in the last 12 months? a. Supplemental Nutritional Assistance Program b. National School Lunch Program c. Women, Infants, and Children (WIC) d. Head Start Program	1. Yes (1) 2. No (0) [Reverse coded]

Table 6. Student Monthly Expenditure Scale (MES)

QUESTION	RESPONSE OPTIONS & CODING
24. What is the TOTAL amount of money that you spend on the following things during an average month?	1. \$0 2. \$1-50 3. \$51-100 4. \$101-150 5. \$151-200 6. More than \$200
a. Groceries	
b. Eating out	
c. Shopping (non-food items such as clothes, shoes, etc.)	[Reverse coded]
d. Transportation (car payment, gas, etc.)	
e. Entertainment (sporting events, going out, etc.)	

**Table 7-A. Potential Barriers to Student Food Security:
Lack of Attachment, Food Experience, and Not Eating Healthy**

<i>UT Attachment Scale (UT-AS)</i>	
QUESTION	RESPONSE OPTIONS & CODING
<p>3. Please tell me the extent you AGREE or DISAGREE with each of the following statements about UT based on the following scale.</p> <p>a. I know the name of many of my classmates</p> <p>b. I feel I can ask my classmates for help</p> <p>c. I feel welcome at UT</p> <p>d. I can really be myself at UT</p> <p>e. I miss UT when I'm away from it too long</p> <p>f. I have an emotional attachment to UT</p> <p>g. UT reflects my values and the kind of person I am</p>	<p>1. Strongly Agree</p> <p>2. Agree</p> <p>3. Neither Agree nor disagree</p> <p>4. Disagree</p> <p>5. Strongly Disagree</p>
<i>Barriers to Eating Healthy Scale (BEHS)</i>	
QUESTION	RESPONSE OPTIONS & CODING
<p>6. How much do the following things PREVENT you from eating a healthy diet?</p> <p>a. Lack of knowledge about how to prepare and cook food</p> <p>b. Lack of knowledge about how to eat healthy</p> <p>c. Lack of time due to school, work, or other obligations</p> <p>d. Lack of adequate cooking facilities, kitchenware, and/or food storage where I live</p> <p>e. Lack of transportation or easy access to grocery stores</p> <p>f. Lack of nearby grocery stores</p> <p>g. Lack of healthy foods that are affordable</p> <p>h. Lack of healthy food options on campus</p> <p>i. Lack of healthy food options off campus</p> <p>j. Lack of university guidelines or information about eating healthy</p> <p>k. Lack of encouragement from family and friends to eat healthy</p>	<p>1. Not at all</p> <p>2. Very Little</p> <p>3. Somewhat</p> <p>4. Quite a Bit</p> <p>5. A Great Deal</p> <p>[Reverse coding]</p>

**Table 7-B. Potential Barriers to Student Food Security:
Lack of Attachment, Food Experience, and Not Eating Healthy** *(continued)*

UT Food Experience Scale (UT-FES)

QUESTION	RESPONSE OPTIONS & CODING
<p>7. How would you RATE your overall experience of obtaining your food from the following places on CAMPUS?</p> <ul style="list-style-type: none"> a. On-campus dining halls b. PCB Café in the Presidential Court Building* c. Southern Kitchen (Volunteer Hall)* d. Fresh Food Company (Buffet in Stokely Hall)* e. PODs, on-campus convenient food stores f. Subway (Student Union) g. Qdoba (Student Union)* h. Chick-fil-la (Student Union) i. Panada Express (Student Union)* j. Rising Roll (Student Union)* k. Steak' n Shake (Student Union)* l. Twisted Taco (Fred Brown Hall)* m. Smokey's Pantry* n. Einstein Bros. Bagels* o. Starbucks* 	<ul style="list-style-type: none"> 1. Very Negative 2. Negative 3. Neither Negative nor Positive 4. Positive 5. Very Positive 6. I never get food here* <p>[Reverse coded]</p>

* Responses placed in "missing values" and excluded from further analysis

Table 8. Food Coping Strategies Scale (FCSS)

QUESTION	RESPONSE OPTIONS & CODING
25. How often in the last 12 months prior to the coronavirus outbreak and UT classes going online, did you use the following strategies when you were running low on food?	1. Often (3) 2. Sometimes (2) 3. Never (1) [Reverse coded]
a. I cut back on basic expenses (e.g. utilities, housing, etc.)	
b. I borrowed money from family or friend	
c. I got free food on campus, at a food back/pantry, or another place	
d. I used food coupons	
e. I split food cost with others	
f. I bought food with a credit card*	
g. I took food home from an on-campus dining hall	
h. I sold or traded my personal items	

* Response place in “missing values” and excluded in the analysis based on item analysis.

Table 9. Descriptive Summary of Scales

<i>Scale</i>	<i>Items</i>	<i>Range</i>	<i>Mean</i>	<i>SD</i>	<i>Alpha</i>
Prior Food Insecurity Scale (PFIS)	2	2-6	2.51	.96	.824
Financial Security Scale (FSS)	5	0-4	.90	.94	.437
Food Assistance Scale (FAS)	4	0-3	0.21	.61	.645
Monthly Expenditure Scale (MES)	5	5-30	21.2	4.6	.785
UT Attachment Scale (UT-AS)	7	7-30	16.9	5.1	.847
UT Food Experience Scale (UT-FES)	4	4-20	9.4	2.6	.703
Barriers-Eating Healthy Scale (BEHS)	11	11-49	27.8	7.9	.831
Food Coping Strategies Scale (FCSS)	8	7-21	10.6	3.0	.747
Student Food Insecurity Scale (SFIS)	11	4-24	8.3	4.8	.899

Table 10. Sociodemographic Characteristics of the Final Sample of Undergraduate Social Science Student Respondents

	<i>%</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>
Academic Year	100.0	206	2.9	1.1
Freshmen (1)	15.0	31		
Sophomore (2)	18.4	38		
Junior (3)	29.6	61		
Senior (4)	36.9	76		
Graduate*		4		
Gender	100.0	205	.68	.47
Male (0)	31.7	65		
Female (1)	68.3	140		
Race/ Ethnicity	100.0	207	.18	.39
Non-Hispanic White (0)	74.4	154		
Non-Hispanic Black/AA (1)	10.6	22		
Asian*	6.8	14		
Hispanic (1)	5.8	12		
Am. Indian/Alaskan Native*	1.4	3		
Nat. Hawaiian/Pacific Islander*	1.0	2		
Personal Monthly Income	100.0	207	4.3	1.0
>\$2,000 (1)	4.8	10		
\$1,501-\$2,000 (2)	1.9	4		
\$1,001-\$1,500 (3)	8.2	17		
\$501-\$1,000 (4)	27.5	57		
<\$500 (5)	57.5	119		
Student Athlete	100.0	209	.95	.21
Yes (0)	4.8	10		
No (1)	95.2	199		
Residency	100.0	208	.70	.46
On-Campus (0)	30.3	63		
Off- Campus (1)	69.7	145		

Notes: * Respondents excluded from the statistical analysis

** Figures in the parentheses are the numbered coding used in the analysis

Table 11. Student Food Insecurity Scale (SFIS): Items and Responses

	<i>%</i>	<i>N</i>	<i>Mean</i>	<i>SD</i>
SFIS	100.0	214	8.3	4.8
Q8. Food Availability	100.0	221	1.6	.63
Enough food I like (1)	43.9	97		
Enough, but not always food I like (2)	48.9	108		
Sometimes not enough food to eat (3)	6.8	15		
Often not enough to eat (4)	0.4	1		
Q9a. Food Worry-\$	100.0	220	.68	.47
Never (1)	61.8	136		
Sometimes (2)	28.6	63		
Often (3)	9.5	21		
Q9b. Ran Out of Food-\$	100.0	219	1.4	.63
Never (1)	63.0	154		
Sometimes (2)	29.7	22		
Often (3)	7.3	16		
Q9c. Can't Afford Eat Bal-Meals	100.0	218	1.7	.74
Never (1)	50.0	109		
Sometimes (2)	33.5	73		
Often (3)	16.5	36		
Q10. Cut Meal Size/ Skip Meals-\$	100.0	220	.35	.48
No (0)	65.0	143		
Yes (1)	35.0	77		
Q11. IF YES, How Often	100.0	77	2.1	.75
1 or 2/ month (1)	24.7	19		
Some, but not all months (2)	44.2	34		
Almost every month (3)	31.2	24		
Q12 Eat Less Than You Should-\$	100.0	217	.35	.48
No (0)	64.5	140		
Yes (1)	35.5	77		
Q13. Hungry-No Food-\$	100.0	218	.24	.43
No (0)	76.1	166		
Yes (1)	23.9	52		
Q14. Lost weight-lacked food	100.0	119	.17	.38
No (0)	82.9	180		
Yes (1)	17.1	37		
Q15. Not Eat Whole Day-\$	100.0	219	.09	.29
No (0)	90.9	199		
Yes (1)	9.1	20		
Q16. IF YES, How Often	100.0	19	2.0	.75
1 or 2/ month (1)	26.3	5		
Some, but not all months (2)	47.4	9		
Almost every month (3)	26.3	5		

Table 12. Student Food Insecurity Scale (SFIS) By Groups

	<i>N</i>	<i>Food Secure</i>	<i>Food Insecure</i>
All Respondents	214	71.5%	28.5%
Whites	153	73.9%	26.1%
Blacks & Hispanics	33	63.6%	36.4%
Blacks	21	66.7%	33.3%
Hispanics	12	58.3%	41.7%
Asian	14	71.4%	28.6%
Am. Indian & Pacific Islanders	3	66.6%	33.4%
[No Designation for Race or Ethnicity]	11	63.6%	36.4%

**Table 13. Pearson (Bivariate) Correlations
with Student Food Insecurity Scale (SFIS)**

Variables	<i>r</i> Coefficients
Sociodemographic Variables	
Academic Year (Freshmen to Senior)	-.039
Gender (M/F)	-.003
Race/Ethnicity (White/Blacks & Hispanics)	.099*
Personal Monthly Income (>\$2000 to <500)	.128**
Student Athlete (yes/no)	-.052
Residency (on/off campus)	-.006
Food Insecurity Variables	
Prior Food Insecurity Scale (PFIS, low to high)	.424***
Financial Security Scale (FSS, high to-low)	.095*
Food Assistance Scale (FAS, low to high)	.112*
Monthly Expenditures Scale (MES, high to low)	.106*
Barriers to Food Security	
(1) UT Attachment Scale (UT-AS, high-low)	.280****
(2) UT Food Experience Scale (UT-FES, positive-negative)	.378****
(3) Barriers-Eating Healthy Scale (BEHS, low-high)	.387****
Food Coping Strategies Scale (FCSS, less-more)	.537**

* $p < .10$; ** $p < .05$; *** $p < 0.01$, **** $p < 0.001$: 1-tailed tests

Table 14. Effects of Sociodemographic and Food Insecurity Variables on Student Food Insecurity Scale (SFIS)

	<i>B</i>	<i>SE</i>	<i>Beta</i>	<i>t</i>
Food Coping Strategies Scale (FCSS)	.680**	1.00	.432	6.8
UT Food Experience Scale (UT-FES)	.496**	.128	.243	4.0
Barriers-Eating Healthy Scale (BEHS)	.154**	.041	.236	3.8
Prior Food Insecurity Scale (PFIS)	1.11*	.126	.218	3.5
UT Attachment Scale (UT-AS)	.058	.838	.053	0.84
Personal Income	.208	.321	.033	0.54
<i>Constant</i>	-10.8			
$R^2 = .552$				
$F\text{-ratio} = 36.63, p < .001$				
$Standard\ Error\ (SEE) = 3.4, df = 4$				
$N = 138$				

Notes: Significance * $p < .01$ ** $p < .001$

Table 15. Effects of Sociodemographic and Food Insecurity Variables on Student Food Insecurity Scale (SFIS) ¹

	<i>B</i>	<i>SE</i>	<i>Beta</i>	<i>t</i>
Food Coping Strategies Scale (FCSS)	.668**	.09	.415	7.4
Barriers-Eating Healthy Scale (BEHS)	.154**	.041	.236	3.8
Prior Food Insecurity Scale (PFIS)	1.22**	.299	.227	4.1
UT Attachment Scale (UT-AS)	.163*	.051	.173	3.2
Personal Income	.208	.321	.040	0.65
<i>Constant</i>	-8.5			
<i>R</i> ² = .448				
<i>F</i> -ratio = 39.12, <i>p</i> < .001				
<i>Standard Error</i> (SEE) = 3.6, <i>df</i> = 4				
<i>N</i> = 197				

Notes: (1) Model excludes the *UT Food Experience Scale* that limited cases to 138 (see Table 14).
Significance * *p* < .01 ** *p* < .001

A-1. Email #1. Invitation for Course Instructors to Forward Survey.

Subject line: Graduate Student Needing Your Help with Research Project!

Dear Fellow Volunteer,

I hope you and your family and friends are doing well.

My name is Bryan Clayborne and I am conducting research for my master's degree in environmental sociology here at UT. My research study is centered on determining the degree of food insecurity among undergraduate students at UT and its causes and consequences.

Due to the coronavirus outbreak and UT classes going online, **I am writing to ask if you would forward this email to your students and allow them to take my survey.**

The survey should take students between 10-15 minutes to complete. Being a part of this study is up to your students and they have the right to not participate. However, students will have the opportunity to enter their email address to enter a drawing for one of five \$10 Walmart Gift Cards. I assure your students that their answers will be kept confidential and will not be connected to their email addresses in any way.

In the attachments above, I have listed one course for you to forward this email to.

Your help in this process would be greatly appreciated!

Follow this link to the Survey:

[Take the survey](#)

Or copy and paste the URL below into your internet browser to take the survey:

<https://utkfoodsecurity2020.questionpro.com>

Thank you,



Bryan Clayborne
Graduate Teaching Associate
M.A. Candidate, Sociology
University of Tennessee
bclaybor@vols.utk.edu
757-292-6473

A-2. Email #2. Reminder for Course Instructors to Forward Survey.

Subject line: Graduate Student Needing Your Help with Food Insecurity Research

Dear Fellow Volunteer,

I hope you and your family and friends are doing well.

I just wanted to follow up on the email I sent last Monday about taking part in my research study on food insecurity.

Having access to food is an important issue that can affect your student's ability to perform academically and their overall health. My survey will ask students about their access to food, level of stress, and what coping strategies they use to obtain food.

Due to the coronavirus outbreak and UT classes going online, **I am writing to ask if you would forward this email OR forward the attached PDF file titled "Food Security Survey Prompt" to your students and allow them to take my survey.**

In the attachments above, I have listed one course for you to forward this email to.

Your help in this process would be greatly appreciated!

Thank you!

For Students Only:

Enter the URL below into your internet browser to take the survey:

<https://utkfoodsecurity2020.questionpro.com>

Best,



Bryan Clayborne
Graduate Teaching Associate
M.A. Candidate, Sociology
University of Tennessee
bclaybor@vols.utk.edu
757-292-6473

A-3. Email #3. Final Reminder for Course Instructors to Forward Survey.

Subject line: Request from Dr. Jones from the Sociology Department

Dear professor or instructor,

On April 6th and April 13th, we wrote to you asking if you would forward an attached PDF titled “Food Insecurity Survey” to your students. This PDF provides students with information about my study and instructions on how to take the survey. My research seeks to determine rates of food insecurity among undergraduate students and barriers students face that differ by household income, race, and ethnicity.

We are writing to you again because the study’s usefulness depends on your willingness to forward the attached PDF to your students. I would like all voices and views to be represented in my study and to accurately depict food insecurity issues on campus to help inform the university.

I realize that these are very unusual and unfortunate times we are living in. However, we would genuinely appreciate your help in this process. Thank you to those who have already informed your students about my study. I would like to encourage you to remind your students again to take the survey.

In the attachments above, a PDF titled “Food Insecurity Survey” is listed. I would like for you to forward this file to your students. Along with this, a letter of support is attached. In this letter it lists one course for you to forward the PDF to.

I would be happy to answer any questions you may have about this study through my email at bclaybor@vols.utk.edu or by phone number at (757)-292-6473.

Thank you very much for your assistance.

Best,
Bryan Clayborne
Graduate Teaching Associate
M.A. Candidate, Sociology
University of Tennessee
bclaybor@vols.utk.edu
757-292-6473

A-4. Email #4. Invitation for Black Student Organizations to Complete Survey.

Subject line: Food Insecurity Research

Dear [Black Student Organization]:

I hope you and your family and friends are doing well.

My name is Bryan Clayborne and I am conducting research for my master's in environmental sociology here at UT. My research focuses on food insecurity among undergraduate students. Food insecurity is referred to as the limited or uncertain availability of nutritionally adequate and safe foods.

Having access to food is especially important for students as it can affect their overall health and ability to perform academically. In particular, my study seeks to determine rates of food insecurity among undergraduate students and barriers students face that differ by household income, race, and ethnicity.

I am writing to your organization because I would like all voices and views to be represented in my study including the black student population. In 2018, the United States Department of Agriculture found that "black-headed households were more likely to experience higher rates of food insecurity than the national average." Having a representative sample would accurately depict food insecurity issues on campus and help inform the university.

I am writing to ask if you would forward this email with the attached PDF titled "Food Insecurity Survey" to your organizational members. The attached file provides students with information about my study and instructions on how to take the study.

I hope you and your organizational members are doing well during this chaotic time.

Your help in this process would be greatly appreciated!

Best,

Bryan Clayborne

Graduate Teaching Associate
M.A. Candidate, Sociology
University of Tennessee
bclaybor@vols.utk.edu
757-292-6473

A-5. Letter of Support.

April 6, 2020

Dear Fellow Volunteer,

I hope you and your family and friends are healthy.

I need your help. I am chairing Bryan Clayborne's Master's Thesis in Sociology. Bryan is trying to determine the degree of food insecurity among UTK students and to identify its possible causes and consequences. He has developed a series of hypotheses that are linked together into an exploratory model that he will use to better understand food insecurity among social science undergraduates at UTK. The theoretical framework for his model is based upon his extensive review of the literature and from his own insights.

Bryan had planned to implement an in-class, self-administered survey in April **but he will not be able to do this because of the coronavirus.** Instead, we have been forced to find a viable alternative. We decided the only way to do the survey was on-line and to ask professors and instructors for their help in its implementation.

We worked during spring break to transform the survey so that it could be **taken by students on-line.** We also have identified the classes that we will draw the students from (undergraduates enrolled in social science classes) and that is **why** we are asking for your help. Bryan will need a high response rate and at least 400 students to complete the survey in order to test the model and to conduct subgroup analysis between freshmen, sophomores, juniors, and seniors as well as between people of color and whites. Bryan's proposal for his master's research was approved by the IRB and we are expecting the changes that we had to make due to UT switching to on-line classes will be approved shortly.

Bryan will send you details about the study and how you can help him, but basically, **we would like you to encourage your students to complete his survey and send them a couple of email reminders to complete it.** Bryan will make available to you a summary of his findings.

Bryan is a serious, hard-working, and gifted young scholar and his master's research means a great deal for him. I also think it will be published and that he will continue to pursue research on food insecurity and food justice.

Please help Bryan on this important task and feel free to contact me for more information.

Respectfully,

Robert Emmet Jones

Robert Emmet ("Bobby") Jones

Professor, Department of Sociology

Senior Research Fellow: Institute for a Secure and Sustainable Environment

and the Center for the Study of Social Justice

mountain@utk.edu

A-6. Introduction to Research Study Flyer.

Introduction to Food Insecurity Research Project

Hello everyone! My name is Bryan Clayborne. I am an environmental sociology graduate student here at UT and I am collecting data for my thesis project. My research topic focuses on food insecurity among undergraduate students. Food insecurity occurs when a person has limited access or no access at all to healthy food items that will sustain their lifestyle.

Having access to healthy food is especially important for students as it can affect your overall well-being and ability to perform academically. A review conducted by the U.S. General Accounting Office found that out of approximately 200 college campuses food insecurity rates ranged from 9% to 50%. However, none of these studies had a diverse random sample. Not only does my study seek to determine rates of food security and food insecurity among undergraduates but it also explores the barriers students, like you, may face that differ by income, levels of stress, and ability to find coping strategies. My study also examines rates of food insecurity before and during the coronavirus pandemic. Lastly, my study seeks to ensure that it has a diverse random sample that is inclusive of gender, race, and class.

Having an accurate sample where everyone is represented, and all voices are heard is extremely important and vital. This information will help illustrate the issues we face on campus and inform the university of the state of their students. Therefore, I invite you to take the survey linked below. The survey should take only 10 minutes to complete and will provide indispensable information for years to come regarding student life and well-being. After completing the survey, you will have the opportunity to enter to win one of ten \$15 Walmart Gift Cards. Being a part of this study is completely voluntary and you have the right to not participate. I assure you that your answers will be kept confidential and will not be connected to you or your email address in any way. Thank you for your time.

Please enter the URL below to begin the survey:

<https://utkfoodsecurity2020.questionpro.com>

Or scan the QR code below to begin the survey:



A-7. Survey Flyer.



You are invited to participate in a Food Justice survey

Sociology graduate student, Bryan Clayborne, is conducting a survey to examine rates of food security and food insecurity among undergraduate students.

Scan the QR Code or enter the URL below to begin the survey and five participants will win a \$10 Walmart Gift Card.

<https://utkfoodsecurity2020.questionpro.com>

You must be a current UT undergraduate student who is 18 years or older.

Taking the survey is not necessary to enter the gift card drawing, please contact Bryan at bclayborne@utk.edu to enter drawing or for any questions.



A-8. Survey.

Informed Consent Statement

Occupy the Food Supply: The University of Tennessee and Food Insecurity

Purpose of Study

You are invited to participate in a research study about food insecurity at the University of Tennessee. The purpose of this study is to access bridges and barriers students face to securing food security. I hope that this information will help the University of Tennessee consider ways to address food insecurity, improving the healthfulness of its students.

Can I participate?

You must be a University of Tennessee student and you must be at least 18 year or older to participate in the study.

What will I be asked to do?

You will be asked to complete a short survey that should take between 10-15 minutes to complete. The survey includes questions about food insecurity and related topics such as lifestyle.

Benefits of Participation

There are no anticipated direct benefits to you that will result from participating in this study. We hope the knowledge gained from this study will benefit other students in the future.

Risks of Participation

There are no risks associated with this project.

Confidentiality

All of your answers will remain confidential and your name is not listed on the survey and will not be linked to your answers in any way.

Can I say no?

Participation is entirely voluntary, and you have the right to not partake in the survey. After you submit the survey, we cannot remove your responses because we will not know which responses came from you. Either way, your decision will not affect your grades, your relationships with your instructors, or standing with the University of Tennessee.

Will I be paid for being in this research study?

A \$10 Gift Card will be administered to five random select winners. Gifts cards will be issued through the U.S. mail system. After you complete the survey, you have the chance to enter into the drawing pool. You have a 1% chance of winning or 1:80 odds of winning. If you do not wish to complete the survey you are still eligible to enter by contacting Bryan Clayborne at bclaybor@vols.utk.edu to be entered into the drawing. Your responses are anonymous, confidential, and no links will be made between you or your responses.

Contact Information

If you have any questions or concerns about this study or have experienced a research-related problem or injury, contact the researchers, Bryan Clayborne at 757-292-6473 or bclaybor@vols.utk.edu or Dr. Robert Jones at 865-974-7017 or mountain@utk.edu.

For questions or concerns about your rights or to speak with someone other than the research team about this study, please contact:

Institutional Review Board
The University of Tennessee, Knoxville
1534 White Avenue
Blount Hall, Room 408
Knoxville, TN 37996-1529
Phone: 865-974-7697
Email: utkirb@utk.edu

CONSENT

I have read this form, been given the chance to ask questions and have my questions answered. If I have more questions, I have been told who to contact. By completing and returning the survey, I understand that I am agreeing to be in this study. I can keep a copy of this consent information for future reference. If I do not want to be in this study, I do not need to do anything else.

GREETINGS FELLOW VOLUNTEER! My name is Bryan Clayborne and I am conducting research for my master's degree at UT. I am trying to determine the degree of food insecurity among students at UT and its causes and consequences. I really would appreciate your help on this research by completing the following survey.

Thanks and GO VOLS! – Bryan Clayborne

First, I would like to ask you about your experiences at the University of Tennessee, your health, diet and other related issues.

Q1. Have you taken this survey before?

- 1. Yes
- 2. No

Q2. How would you rate your overall experience at UT?

- 1. Very Negative
- 2. Negative
- 3. Neither Positive nor Negative
- 4. Positive
- 5. Very Positive

Q3. Please tell me the extent you AGREE or DISAGREE with each of the following statements about UT based on the following scale.

- | | |
|-----------------------------|--------------------------|
| 1-Strongly Agree (SA) | 4-Disagree (D) |
| 2-Agree (A) | 5-Strongly Disagree (SD) |
| 3-Neither Agree or Disagree | |

- a. I know the name of many of my classmates
- b. I feel I can ask my classmates for help
- c. I feel welcome at UT
- d. I can really be myself at UT
- e. I miss UT when I'm away from it too long
- f. I have an emotional attachment to UT
- g. UT reflects my values and the kind of person I am

Q4. How would you rate your current health?

- 1. Very good
- 2. Good
- 3. Fair
- 4. Poor
- 5. Very poor

Q5. How much importance do you place on eating a healthy diet?

- 1) Very important
- 2) Important
- 3) Neither important nor not important
- 4) Somewhat important
- 5) Not at all important

Q6. How much do the following things PREVENT you from eating a healthy diet?

- | | |
|--------------------|---------------------|
| 1- Not at All (N) | 4- Quite a Bit (Q) |
| 2- Very Little (V) | 5- A Great Deal (G) |
| 3- Somewhat (S) | |
- a. Lack of knowledge about how to prepare and cook food
 - b. Lack of knowledge about how to eat healthy
 - c. Lack of time due to school, work, or other obligations
 - d. Lack of adequate cooking facilities, kitchenware, and/or food storage where I live
 - e. Lack of transportation or easy access to grocery stores
 - f. Lack of nearby grocery stores
 - g. Lack of healthy foods that are affordable
 - h. Lack of healthy food options on campus
 - i. Lack of healthy food options off campus

- j. Lack of university guidelines or information about eating healthy
- k. Lack of encouragement from family and friends to eat healthy

Q7. How would you RATE your overall experience of obtaining your food from the following places on CAMPUS?

- | | |
|---------------------------------------|--------------------------|
| 1- Very Negative (VN) | 4- Positive (P) |
| 2- Negative (N) | 5- Very Positive (VP) |
| 3- Neither Negative nor Positive (NP) | 6- I never get food here |

- a. On-campus dining halls
- b. PCB Café in the Presidential Court Building
- c. Southern Kitchen (Volunteer Hall)
- d. Fresh Food Company (Buffet in Stokely Hall)
- e. PODs, on-campus convenient food stores
- f. Subway (Student Union)
- g. Qdoba (Student Union)
- h. Chick-fil-la (Student Union)
- i. Panada Express (Student Union)
- j. Rising Roll (Student Union)
- k. Steak' n Shake (Student Union)
- l. Twisted Taco (Fred Brown Hall)
- m. Smokey's Pantry
- n. Einstein Bros. Bagels
- o. Starbucks

The next set of questions pertain to your access to food in the past 12 months prior to the coronavirus outbreak and UT classes going online. Please select the response choice that best applies to you.

8. Which statement best describes the food available to you in the past 12 months prior to the coronavirus outbreak and UT classes going online?

- 1. Enough of the kinds of food I wanted to eat
- 2. Enough, but not always the kinds of food I wanted to eat
- 3. Sometimes not enough food to eat
- 4. Often not enough food to eat

9. Please tell me how often you have done the following things in the last 12 months prior to the coronavirus outbreak and UT classes going online.

1-Often

2-Sometimes

3-Never

1. I worried whether my food would run out before I got money to buy more
2. The food I brought just didn't last, and I didn't have money to get more
3. I couldn't afford to eat balanced meals

10. In the last 12 months prior to the coronavirus outbreak and UT classes going online, did you ever cut the size of your meals or skip meals because there was not enough money for food?

- 1) Yes
- 2) No

11. How often did you cut the size of your meals or skip meals because there was not enough money for food in the last 12 months prior to the coronavirus outbreak and UT classes going online?

- 1) Almost every month
- 2) Some months, but not every month
- 3) Only one or two months

12. In the last 12 months prior to the coronavirus outbreak and UT classes going online, did you ever eat less than you felt you should because there was not enough money for food?

1. Yes
2. No

13. In the last 12 months prior to the coronavirus outbreak and UT classes going online, were you ever hungry but did not eat because there was not enough money for food?

1. Yes
2. No

14. In the last 12 months prior to the coronavirus outbreak and UT classes going online, did you lose weight because there was not enough money for food?

1. Yes
2. No

15. In the last 12 months prior to the coronavirus outbreak and UT classes going online, did you ever not eat for a whole day because there was not enough money for food?

- 1) Yes
- 2) No

16. Prior to the coronavirus outbreak and UT classes going online, how often did you not eat for a whole day because there was not enough money for food?

- 1. Almost every month
- 2. Some months, but not every month
- 3. Only one or two months

17. Since the coronavirus outbreak and UT moving classes online, how often have you or any member of your household worried about running out of food before you got money to buy more?

- 1. Often
- 2. Sometimes
- 3. Never

18. Since the coronavirus outbreak and UT moving classes online, how often has the food you had in your household run out and there was not enough money to buy more?

- 1. Often
- 2. Sometimes
- 3. Never

19. Before attending UT, how often did you or any member of your household worry about running out of food before you got money to buy more?

- 1. Often
- 2. Sometimes
- 3. Never

20. Before attending UT, how often did the food you had in your household run out and there was not enough money to buy more?

- 1. Often
- 2. Sometimes
- 3. Never

The next set of questions ask you about your feelings during the last 30 days prior to the coronavirus outbreak and UT classes going online. Please select the answers that best apply to you.

Never-0, Almost Never-1, Sometimes-2, Fairly Often-3, Very often-4

Q21. How often have you felt that you were unable to control the important things in your life?

Q21. How often have you felt nervous and “stressed”?

Q21. How often have you felt confident about your ability to handle your personal problems?

Q21. How often have you felt that things were going your way?

Q21. How often have you felt that you could not cope with all the things that you had to do?

Q21. How often have you felt that difficulties were piling up so high that you could not overcome them?

The next set of questions ask you about your after the coronavirus outbreak and UT classes going online. Please select the answers that best apply to you.

Never-0, Almost Never-1, Sometimes-2, Fairly Often-3, Very often-4

Q22. How often have you felt that you were unable to control the important things in your life?

Q22. How often have you felt nervous and “stressed”?

Q22. How often have you felt confident about your ability to handle your personal problems?

Q22. How often have you felt that things were going your way?

Q22. How often have you felt that you could not cope with all the things that you had to do?

Q22. How often have you felt that difficulties were piling up so high that you could not overcome them?

The next set of questions ask for information about you and your monthly expenditures. All of your answers will be kept confidential. Please select the answers that best apply to you.

Q23. What is TOTAL amount of money that you spend on RENT, UTILITIES, WI-FI per month?

1. \$0
2. \$1-500
3. \$501-750
4. \$751-1000
5. More than \$1000 per month

Q24. What is the TOTAL amount of money that you spend on the following things during an average month?

	\$0	\$1-50	\$51-100	\$101-150	\$151-200	More than \$200
Groceries						
Eating Out						
Shopping (clothes, shoes, etc.)						
Transportation (car payment, gas, public bus, electric scooter, etc.)						
Entertainment (concerts, sporting events, going out, etc.)						

Q25. How often in the last 12 months prior to the coronavirus outbreak and UT classes going online, did you use the following strategies when you were running low on food?

Strategies	Often (1)	Sometimes (2)	Never (3)
I cut back on basic expenses (e.g. utilities, housing, medications, transportation, etc.)			
I borrowed money from family or friends			
I got free food on campus, at a food bank/pantry, or another place			
I used food coupons			
I split food cost with others			
I bought food with a credit card			
I took food home from an on-campus dining hall			
I sold or traded my personal items			

These last items are demographic questions that will be used for STATISTICAL PURPOSES ONLY. We can assure you that your individual responses will not be associated with you but will remain CONFIDENTIAL.

Q26. What is your student status?

1. Freshman
2. Sophomore
3. Junior
4. Senior
5. Graduate Student

Q27. How long have you been enrolled at UT?

1. Less than one year
2. 1 year
3. 2 years
4. 3 years
5. 4 years
6. 5 years
7. 6 years
8. 7 years
9. More than 7 years

Q28. Do you live:

1. On-campus
2. Off-campus

Q29. Do you currently participate in a dining plan (meal plan) that you purchased from the university?

1. Yes
2. No

Q30. Are you a student athlete?

1. No—► Please skip to Q33
2. Yes, please answer Q31 & Q32 below

Q31. Are you on an athletic scholarship?

1. Yes
2. No

Q32. Does your athletic team and/or scholarship offer you unlimited meals and snacks?

1. Yes
2. No

Q33. Aside from your role as a student, which term best describes your employment status?

1. Not working, unemployed
2. One part time job
3. More than one part time job
4. One full time job

Q34. How much would you estimate your personal **monthly** income to be? (Excluding money given by parents and financial aid)?

1. Less than \$500
2. \$501-1000
3. \$1,001-1,500
4. \$1,501-2,000
5. More than \$2,000 per month

Q35. Which of the following do you rely upon for supporting yourself financially while at UT?

1-Yes 2-No

1. Parent/family support
2. Spouse/partner/significant other support
3. Scholarship/grant (that you don't have to pay back)
4. Private or federal loan (that you do have to pay back)
5. Part-time job
6. Full-time job
7. Personal savings

Q36. Do you own or have access to a car on a regular basis?

1. Yes
2. No

Q37. Do you currently have health insurance?

1. Yes
2. No

Q38. Do you have a savings account?

1. Yes
2. No

Q39. Do you have a checking account?

1. Yes
2. No

Q40. Do you have a credit card?

1. Yes
2. No

Q41. Did you or anyone in your household receive food assistance from the following programs in the last 12 months?

1-Yes 2-No

1. Supplemental Nutritional Assistance Program (SNAP/Food Stamps)
2. National School Lunch Program
3. Woman, Infants, and Children Program (WIC)?
4. Head Start Program

Q42. Your gender is:

1. Female
2. Male
3. Other_____

Q43. Are you transgender?

- 1) Yes
- 2) No

Q44. Do you consider yourself to be:

1. Bisexual
2. Gay
3. Heterosexual or straight
4. Lesbian
5. Other_____

Q45. What is your race/ethnicity?

1. American Indian/Alaskan Native
2. Asian
3. Native Hawaiian/Other Pacific Islander
4. Non-Hispanic, Black or African American
5. Non-Hispanic, White
6. Hispanic

Q46. Which department sent you this survey?

1. Africana Studies—Goes to Q47
2. Economics—Goes to Q48
3. Geography—Goes to Q49
4. History—Goes to Q50
5. Political Science—Goes to Q51
6. Psychology—Goes to Q52
7. Sociology—Goes to Q53
8. Student Organization—Goes to Q54

8. Other

- Q47. Which professor in Africana studies department sent you this survey?
- Q48. Which professor in economics department sent you this survey?
- Q49. Which professor in geography department sent you this survey?
- Q50. Which professor in history department sent you this survey?
- Q51. Which professor in political science department sent you this survey?
- Q52. Which professor in psychology department sent you this survey?
- Q53. Which professor in sociology department sent you this survey?
- Q54. Which student organization are you from?
- Q55. Do you have a comments or suggestions that would help improve the survey?

VITA

Bryan Clayborne is a native of Suffolk, Virginia. He graduated from Norfolk State University with a Bachelor of Arts in Sociology in 2018. He completed his Master of Arts in Sociology at the University of Tennessee, Knoxville in 2020. His academic interest includes environmental justice, food justice, and food insecurity. In addition to this, Bryan has taught an introductory environmental course focusing on issues such as environmental injustice, lack of food access, and climate change. Bryan is currently working with Big Brother Big Sister through the AmeriCorps program from 2020-2021.